THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1479.] LONDON, SEPTEMBER 15, 1891. [43RD YEAR. Price 6d.

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THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

The matter composing this book consists mainly of articles written for, and published in, the JOURNAL. The preface says: "In view of new processes that seem to fall in thick and fast one on the other, it has been several times suggested that they should be collected together, so as to form a record of the various gas-making processes that have been proposed in the past, together with some account of the natural laws that govern the manufacture and supply of Illuminating Gas."

The work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

SELF-CONTAINED DUST-FUEL FURNACE.
MELDRUM'S PATENT.

Extract from the *Smethwick Telephone,* June 13, 1891.

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"The Manager [B. W. Smith, Esq.] reported that the adoption of MELDRUM'S PATENT FURNACES, he estimated, had resulted in a saving of 150 tons of Slack during the nine months they had been at work in the Boiler-House, and 360 tons of Slack during four months in the Retort-House; the fuel used in place of slack being the fine coke dust which formerly had to be carted or boated away at considerable expense."

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The Washer is entirely automatic in its action, and does not therefore need any motive power—an advantage which will be apparent to all.

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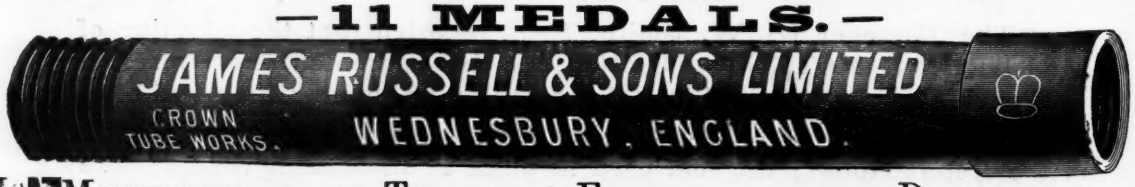

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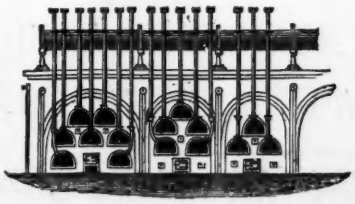

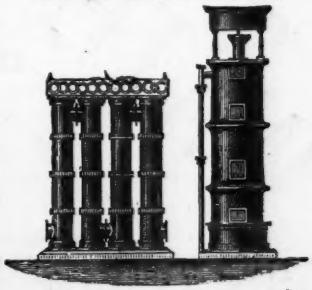

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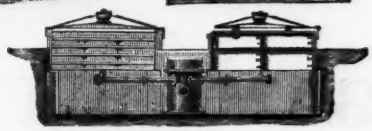

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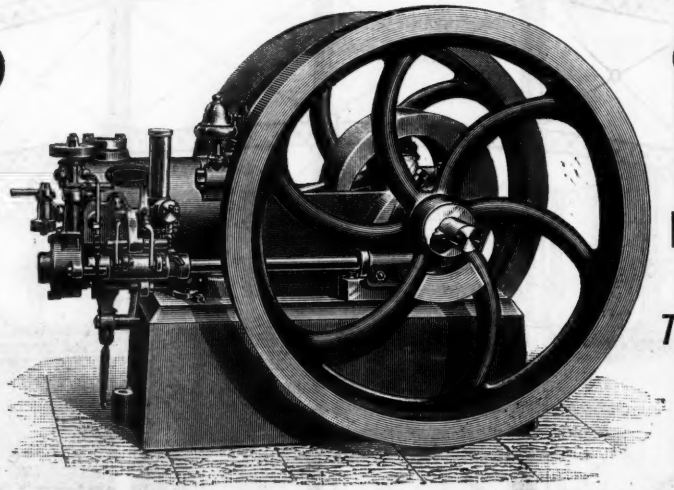

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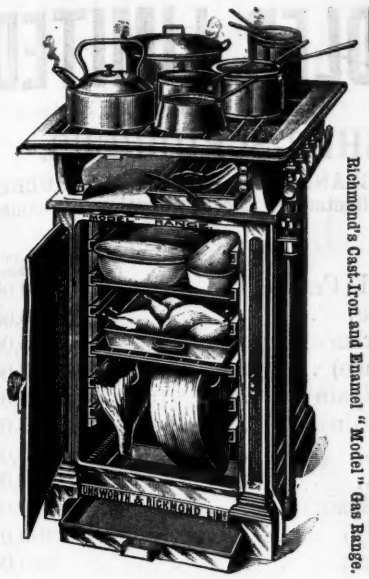
The best Stove made for Hiring out purposes. Can be taken to pieces readily.



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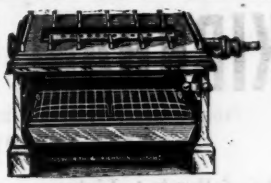
This "Model" Range has been signally successful! So large a demand having been created for it, we have now for the second time in Twelve months enlarged our Works to meet the press of orders.

1.—Its chief advantages for hiring out are: All Oven Fittings, Hot Plate, Hot Plate Burners, Jet Cocks, and Gas Bar, easily removable for Cleaning.

2.—To the General Public: Clean and neat appearance, Special Simmering Burners, Blue and White Enamel, Hot Plate Burners lift out to clean. No screws. Economical and Simple.

3.—The above points are confirmed by Nelson Gas Committee's test, June 3, in which U. & R's. "Model" Range beat Wilson's, Wright's, Davis's, and three other makers for Roasting, Baking, &c., and won first place against all competitors.



Quick Lever Grill.
No. 200 10×9×7½, 7/-. No. 205 12¼×11×8, 10/-.

Burners suitable for heavy work.
No. 300 12ft., 2/6. No. 302 16ft., 3/6. No. 304 20ft., 4/6

As Block. Plain Reeded Rim.
No. 306, 1/8. No. 313, 1/6. No. 315, 3/6.
No. 308, 2/6. No. 314, 2/6.

No.	Inside Dimensions of Oven.			Hot Plate.	Height over all.	Burners on Hot Plate.	For family of	Price unpacked.	Packed and Enamelled.
30	11in.	11in.	17in.	17½in. × 17½in.	28in.	2	2	£2 10 0	£3 0 0
* 40	13in.	12in.	20½in.	18½in. × 18½in.	28in.	3	4	3 0 0	3 10 0
* 50	12in.	12in.	25in.	18½in. × 18½in.	32in.	3	5	3 10 0	4 0 0
100	14in.	13½in.	28¾in.	24in. × 22in.	36in.	4	6		5 15 0
120	16in.	16in.	28¾in.	25½in. × 23¾in.	36in.	5	10		7 0 0
140	18in.	18in.	28¾in.	28in. × 26in.	36in.	6	15		9 0 0
160	22in.	21in.	33in.	31½in. × 30in.	41½in.	7	25 to 30		13 0 0

* Nos. 40 and 50, if fitted with loose Burners, Door Latch, and removable Hot Plate, 10/- extra.

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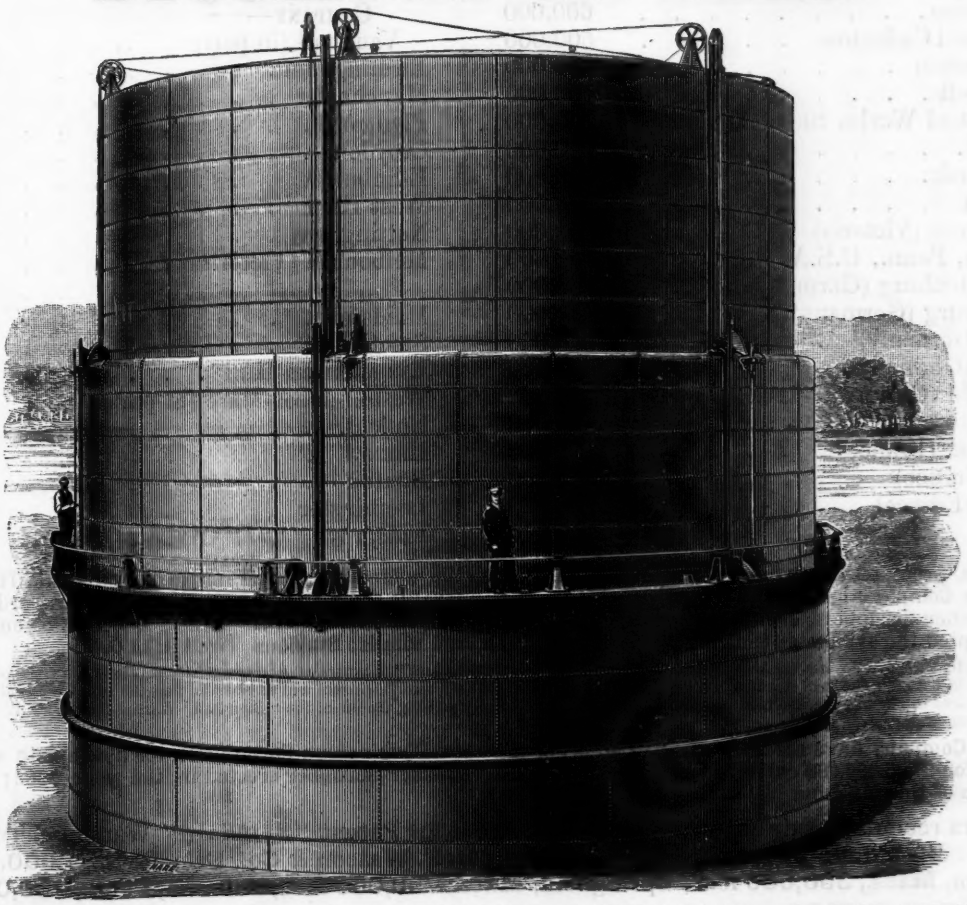

TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

KIRKHAM, HULETT, & CHANDLER, LIMITED.

[SIDNEY HERSEY, Managing Director.] [J. CHANDLER, Engineer.]

NEW PATENT "STANDARD" WASHER-SCRUBBERS.

The following List comprises the orders received for PATENT "STANDARD" WASHER-SCRUBBERS constructed according to the Company's latest patent, and Renewals effected by the application of same to old Pattern Machines.

NEW PATENT "STANDARD" WASHER-SCRUBBERS.

THE GASLIGHT AND COKE COMPANY—	Capacity, cub. ft. per 24 hours.
Kensal Green	3,000,000
,,	3,000,000
Birmingham	5,000,000
West Ham	3,000,000
Liverpool	3,000,000
,,	3,000,000
Rochdale	3,000,000
Manchester	2,500,000
Glasgow	2,500,000
,,	2,500,000
Leicester	2,250,000
Swansea	2,000,000
Derby	1,500,000
,,	1,000,000
Dover	1,000,000
Cambridge	1,000,000
West Bromwich	1,000,000
Warrington	1,000,000
Luton	1,000,000
Valparaiso	600,000
Barry and Cadoxton	500,000
Workington	500,000
Lowestoft	500,000
Atlas Steel Works, Sheffield	250,000
Bangor	250,000
Rawmarsh	200,000
Hitchin	150,000
Melbourne (Victoria)	1,500,000
Altoona, Penn., U.S.A.	750,000
Charlottenburg (Germany)	1,500,000
Magdeburg (Germany)	750,000
Halle (Germany)	600,000
Erfurt (Germany)	400,000
Elberfeld (Germany)	600,000
,, ,,	600,000
Bordeaux (France)	2,000,000
Nice (France)	875,000
Nancy (France)	525,000
,, ,,	525,000
St. Chamond (France)	350,000
Lille (France)	250,000
Baccarat (France)	175,000
Melun (France)	210,000
Barcelona (Spain)	875,000
Valencia (Spain)	875,000
,, ,,	200,000
,, ,,	200,000
Santander (Spain)	350,000
Vercelli (Italy)	200,000
Alger (Algiers)	875,000

RENEWALS.

THE GASLIGHT AND COKE COMPANY—	
Beckton	2,500,000
,,	1,250,000
Nine Elms (in part)	3,000,000
Shoreditch	2,500,000
Pimlico	2,000,000
Bromley	2,000,000
SOUTH METROPOLITAN GAS COMPANY—	
Vauxhall (in part)	3,000,000
Birmingham	5,000,000
Manchester	2,500,000
Plymouth	2,000,000
Croydon	1,500,000
Edinburgh	1,500,000
West Ham	1,500,000
Nottingham	1,500,000
Melbourne (Victoria)	1,500,000
,, ,,	1,500,000
Maidstone	1,000,000
Smethwick	750,000
Kingston-on-Hull	400,000
Weston-super-Mare (in part)	400,000
Enfield	300,000
Harrow	250,000
Buxton	250,000
Leominster	150,000
Kidsgrove	100,000

As a proof of the value of the invention, it may be added that, after an extended trial, The Gaslight and Coke Company have given a second order for the apparatus for their Beckton Works, a third order for two new Washer-Scrubbers, each for 3,000,000 cubic feet of Gas per day, for their Kensal Green Station, and have also adopted the system at their Nine Elms, Shoreditch, and Pimlico Stations (*Vide* List of Orders).

The patent wooden devices are being continually fitted to existing "Standard" Washers where renewals are required, and are made in segmental bundles to fit between the wheel plates, similar to the present iron sheets; and Engineers will at once see that the substitution of the improved wooden devices in place of the indented iron sheets will so very materially prolong the life of the "Standard" Washer-Scrubbers as to warrant the outlay for renewal.

The Company have recently received an order from the Birmingham Corporation for a complete set of these devices for the 5,000,000 cubic feet per day "Standard" Washer-Scrubber erected in the year 1882; also for a duplicate of this Machine (*Vide* List of Orders).

Orders recently advised by United States Agent for Patent "Standard" Washer-Scrubbers as follows: Brookline, Mass., 750,000 cubic feet; H. F. Watson & Co., Erie, Penn., 1,000,000 feet; Taunton, Mass., 300,000 feet; Springfield, Mass., 750,000 feet; Altoona, Penn., 750,000 feet.

ADDRESS: 3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

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IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES.

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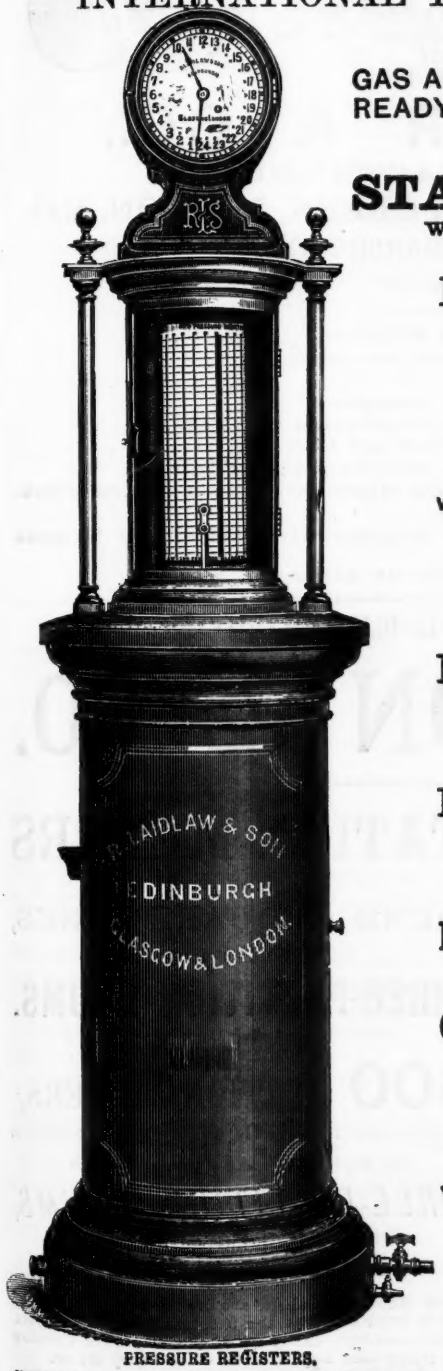

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A LARGE STOCK OF GAS AND WATER METERS ALWAYS READY FOR IMMEDIATE DELIVERY OR SHIPMENT.

STATION METERS,

WITH ROUND OR SQUARE CASES.

Improved Station and Exhauster Governors.

Lamp Pillars,

WITH EITHER WET OR DRY METERS FOR AVERAGE METER SYSTEM.

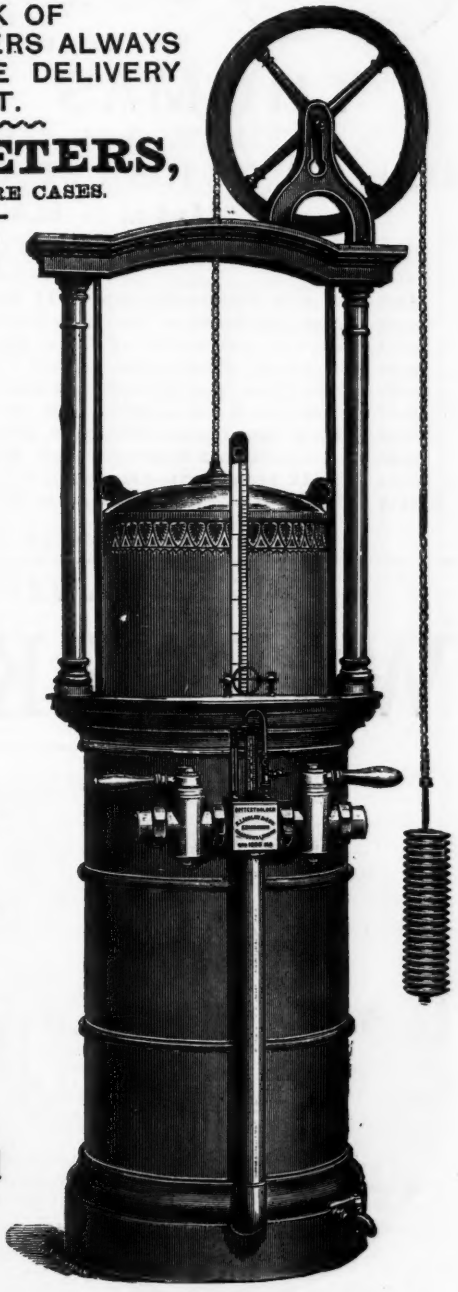
Experimental Hourly-Rate and Test Meters.

Experimental Apparatus.

Pressure Gauges.

Condenser Thermometers.

Siemens' Patent Water Meters, and Gas Apparatus and Fittings.



TEST-HOLDER.

STANDARD TEST-HOLDERS AND TEST-METERS FOR OFFICIAL INSPECTORS, &c.,

AUTHORIZED BY THE BOARD OF TRADE STANDARDS DEPARTMENT.

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ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
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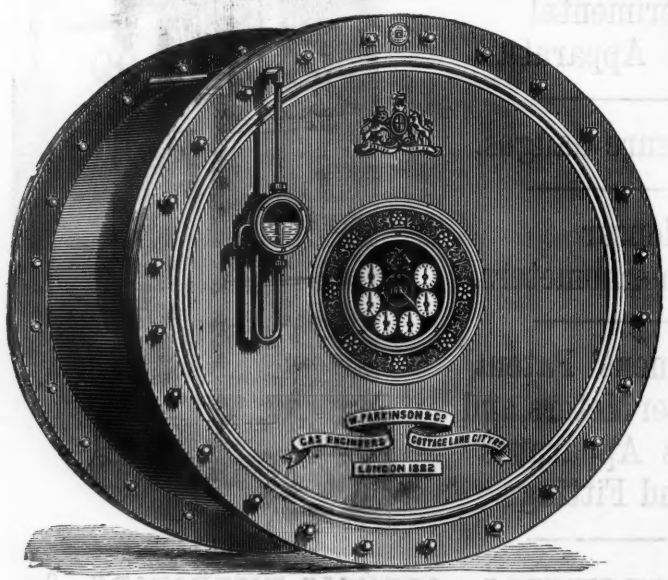
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.

HIGHEST AWARD, MELBOURNE EXHIBITION.

W. PARKINSON & CO.



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IN

ROUND or SQUARE TANKS,

FITTED WITH PATENT

THREE-PARTITION DRUMS.

MORE THAN

300 STATION METERS,

Varying in size from 1200 to 200,000 cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS,

Since their introduction.

ROUND METERS as above are kept in Stock in all Sizes ready to send away at the shortest notice. Compact, portable, and very easily fixed. An Improved Overflow Water-line Regulator fitted to every Meter.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

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BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE, **MANCHESTER.** Telegraphic Address: "PRECISION."

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but Orders for Alterations in or Stoppages of PERMANENT ADVERTISEMENTS should be received Not Later than the FIRST POST on SATURDAY.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 15, 1891.

Trade Unionists in Congress.

THE Trade Union Congress sat all last week; and it is now possible to take some account of the proceedings of this prominent, if not eminent, assemblage. The amount of work done in the meetings is one thing, and the noise made by the delegates is another. Disorder ruled the Congress of last year; and it has been repeated with increase on the present occasion. One year, or even two, of an annual celebration such as this meeting of Unionist workers, may be thrown away without necessarily inflicting damage upon the institution in its permanent aspect; but every repetition of such waste of time is fraught with grave peril. It is now made abundantly clear that unless the Trade Unionists of the United Kingdom wish to see themselves condemned in the general estimation as incapable of conducting a public convention in a proper manner and to good purpose, they must free their meetings from the influences that have ruined the Liverpool and Newcastle congresses. We took note of several anticipations appearing in certain publications that would like to be regarded as authoritative, as to business which the Congress might be expected to deal with; but what has happened has been a wearisome presentment of "bear "garden" scenes, which have prevented anything being done. The whole affair has been in the highest degree discouraging to those who had hoped that men who claim to be workers, and of all things "practical," would show the world—not in all respects very friendly towards their aspirations—that they could at least conduct their own congressional business in a workmanlike manner. Instead of this, the hall of meeting has been the scene of such manifestations of mutual distrust, such outbreaks of class hatred, such declarations of class greed, and those who took part in the proceedings have so continually outraged their own rules, that observers who might have been inclined to believe that the best working-class intellect and character are represented in Trade Unions, may well doubt whether this is the right view of the subject. It must be remembered, however, that the question whether Trade Unions represent the best of the Labour Party, is a different one from the question whether the Trade Union Congress properly represents the Unions. Many workmen who profess the faith which answers the former query affirmatively, would unhesitatingly reply to the latter in the negative.

Most of the trouble at Newcastle arose over the question of the constitution of the Congress, which is falling more and more under the domination of the New Unionist element in its composition—the element, that is, which has less experience, money, and stability than the other. Numbers and clamour have asserted themselves over wealth and ripe counsel, with the result that the proceedings of the Congress have far overpassed the narrow line which proverbially divides the sublime from the ridiculous. According to the design of the promoters of these annual gatherings of Trade Unionists, the community was to be awed by the spectacle of Labour formulating its needs with the grave strength of a party which is also a power in the land. Politicians, economists, philanthropists, and benevolent employers were to be instructed through the resolutions of the Congress in matters appertaining to the improvement of the condition of wage-earners, by the utterances of those who could speak with the authority due to intimate knowledge. Why, it was asked, is it that so many well-intentioned projects for the amelioration of the lot of the workers and the poorer orders of both town and country populations fail of their object? Simply because they are devised by those who have no personal knowledge of the wants and wishes of the working-man. Quite recently the *Trade Unionist* sneered at the last new working-class technological and social institution that was started in South London, and prophesied its failure solely on the score that the proper element—*i.e.*, the New Trade Unionist element—does not rule its managing authority. Does any sane person see in the transactions of the Trade Union Congress reliable proof that the individuals who take part in these proceedings are worthy of confidence in the capacity of guides, philosophers, and friends of the working classes?

It has been said that with workmen in Parliament, on the Bench, serving as jurymen, inspecting factories, constituting school boards, managing co-operative workshops, &c., a new era will dawn upon the country. If this is to be a better era than those of the past or present, the workmen who are to fill these positions must be of a different quality to those who have been busy during the past week in scandalizing their order at Newcastle. There is no disguising the fact that the Congress was composed of a rabble destitute of cohesive influence, and that many of those who posed on its platform as representatives of the British Workman were more truly mere caricatures of him. The most disheartening result of the proceedings of the Congress, when it really transacted anything, is the evidence it put into the hands of the detractors of the workman to support the idea that he really cares more for money than he does for any other of the legislative improvements of his lot for which he is reported by Trade

Union journals to pine. Thus, while the Congress reaffirmed the desirability of workmen becoming members of Parliament, members of local authorities, jurymen, and so forth, it declared that they ought to be paid out of the public funds for the services rendered by them in these various capacities, which citizens of other orders have to serve gratuitously, and often at considerable expense and serious inconvenience. The New Unionist not only wants to rule the roost, but he requires to be paid for doing it. The suggestion that a general subscription of a penny a week per head would pay all expenses of this nature, met with no support at Newcastle. As *The Times* puts it, "the "working man of the new school must have everything "done for him. His road to power must not only be made "smooth, but it must be so contrived as to lead to sub- "stantial pecuniary benefit. On no other terms will he "consent to place his wisdom and experience at the com- "mand of the country." Meanwhile, the style in which he manages his own affairs does not impress the rest of the world with any exalted sense of the value of his administrative powers.

The question of the eight-hours' day was, of course, debated at Newcastle; and notwithstanding the opposition of the majority of miners' representatives, the bulk of the Congress resolved that the legislative enforcement of the eight hours' day should commence forthwith for the mining industry. The majority of the Congress, in effect, overruled the miners, and decided that the latter do not know what is good for themselves. This fatuous appeal to the Legislature to help the workman to obtain a working day of a definite length is, as *The Times* truly points out, a confession of weakness which could hardly have been looked for from such very confident individuals as the professors of the New Unionism. The experience of the gas stokers ought to be productive of different fruit than this pitiful cry to Parliament. It is the proud boast of the leaders of the Gas Workers' Union that they won the cause of the eight-hour shift for gas stokers all over the country; and they are fond of setting all their troubles and losses as an organization to the account of this great contest. The truth of the matter is quite otherwise. The Gas Workers' Union never had any conflict on this point anywhere, and never needed to spend a penny to obtain the eight-hour shift in gas-works. They wasted their strength, and squandered their money, for other purposes; but not for the eight-hour shift, which was conceded wherever asked for, simply because it was a question of money, which statutory gas manufacturers preferred to yield rather than fight upon. Unionist agitators pretend that the additional cost of the eight-hour shift in gas-works came out of the pockets of shareholders of the "bloated "capitalist" stamp, and has therefore been so much clear gain to the labouring class. The fact is, of course, that dividends were not touched by this concession, which merely added so much to the cost of gas making, and stood in the way of future reductions in the price of gas. This, however, is beside the present question, which is why do Unionists cry to Parliament for help in a matter which both miners and gas stokers have been able to settle out of hand for themselves? Tom Mann is fond of calling a Trade Union a means of educating the working man. It occurs to some of us that instruction which is based upon error is worse than none at all; and that in this particular matter of the eight-hour day, it is the men who talk most about it from the standpoint of the New Unionism who need to learn the lesson of truth before they presume to teach others.

A Question of Nomenclature.

An esteemed correspondent has unburdened his soul to us concerning a question of nomenclature. He pays us the compliment of acknowledging the care exercised over the diction of Journal articles, and is kind enough to state that he "constantly notices the extremely good, almost "classical language and expressions in the Journal." Well, we do not care to deny that this is a matter over which we do habitually exercise solicitude; being possessed by the possibly old-fashioned notion that even a technical periodical ought to show some respect to the English language. We like to believe that educated persons, in whom a sense of what is required of a writer of English has been cultivated by the study of good models, can read our articles without shuddering. So far as in us lies, we discountenance slipshod composition, and what may be called "shoppy" style. It is our belief that the great English tongue is capable of dealing even with topics connected with the gas industry without necessitating the creation of a special slang; and we do not hold that a journalistic style of composition, while naturally easier than that appropriate for a formal treatise, need be loose, vulgar, or devoid of conciseness and exactitude. It is with regard to the latter point that our friendly critic enters his amiable protest. He seems to recall our attention to the canon of literary composition which insists that as far as possible the "one man one vote" principle should be acted upon in regard to the use of words. One word should be employed to signify one thing, whenever precision of expression is important. Most people in speaking and writing are sinners against this rule; and it is safe to say that a taste of law is required to instruct persons who have enjoyed what is called a "good general education" with regard to the importance of using the right words to convey their meaning on all occasions. There are very few true synonyms in English—a fact that would not be deduced from the careless misuse of words in ordinary conversation and familiar correspondence. There are many examples of group-systems of words meaning very nearly the same thing, which the infinite differentiations of civilized life have produced, and which heedless speakers and writers use confusedly as though they were not to be distinguished from one another. This is a great pity, for many reasons. It strikes out the beautiful modulated tones of description from the language, which, properly understood, has as many qualifying shades for a single idea as the most fastidious speaker can require. When these are all brutalized by being treated as synonyms, it is as though the resources of a painter's palette were restricted to the primary colours.

To descend from the general to the particular, it should be stated that our correspondent challenges the use of the word stove indiscriminately to describe "cooking ranges, "fires, boiling burners, stoves proper, and in fact all ap- "pliances in which gas is used for heating purposes." This is a grave matter, manifestly of more than academic interest. We are assured that as a matter of fact the too comprehensive use of the term "stove" in connection with apparatus by which gas is consumed for purposes other than lighting, is an evil constantly causing trouble and expense. People ask about "stoves" and make application for "stoves" with a full knowledge in their own minds of what they mean, which is not reproduced by their language in the minds of others. Our correspondent has such boundless faith in the influence of the Journal with regard to such topics of discussion, that he thinks an editorial hint respecting the need for exactitude with regard to the nomenclature of gas apparatus would "tend to clear "matters up all round." We gladly draw attention to the subject, in the hope that our interested readers may see fit to investigate their own conduct in the matter, and, if they feel convicted of having been loose in their language in the past, that they will be more careful in future. Our correspondent holds that since a "stove" for coal or coke is "an apparatus for the production of warmed air only," and "has no other recognized meaning for these fuels," it should have no other for gas fuels. That it to say, in his estimation, a gas cooker is not a "stove" in the proper meaning of the word. We are sorry to betray the existence of a difference of opinion between our correspondent and ourselves upon this point; but much as we sympathize with his principles, his application of them is faulty here. To make nothing of the fact that when gas officials and consumers speak and write of "stoves" for use with gaseous fuel, they do as a rule mean cookers, and that it would be too much to ask them to revolutionize their practice in this respect, we cannot admit that the term stove is improperly applied to a cooking apparatus. It is to be feared that there is nothing for it but the use of a compound word when stoves are to be distinguished—as either "cooking-stoves" or heating-stoves"—while the simple term must continue to apply to both kinds.

The South-Western District Meeting.

The South-West of England District Association of Gas Managers met this day week at Weymouth, under the presidency of Mr. S. W. Durkin, of Southampton. The visitors were welcomed to the town by Mr. Alderman Thomas, the Chairman of the Gas Company, who took the opportunity of expressing the sense of the Directors of

the Company with regard to their obligations to Mr. Lowe, their Manager, for the successful way in which he has discharged the responsible duties of his office. The position of Gas Manager in a place like Weymouth, where the local authorities and the local public are ever striving to add to the attractions of the town, and to show the world that they are in the forefront of fashion in respect of all the conveniences of town life, is by no means one of repose. It is of the utmost importance that in the strivings of a fashionable watering place after attractive novelties—whether of public illumination, street decoration, or private lighting—the cause of gas should be worthily maintained by those who have the interest of the industry at heart; and this is what Mr. Lowe is doing at Weymouth. The south-western gas managers are a very practical body; and their meetings are seldom without something good by way of a paper. On this occasion, the technical interest of the day was well sustained by Mr. D. Irving, of Bristol, who read a useful paper on the storing of coal in gas-works, with special reference to the question of heating. The subject is of great and increasing importance, in view of the recognized necessity of laying in larger reserves of coal than were formerly deemed sufficient in most gas manufacturing stations in this country. Mr. Irving has to deal with coal from the Bristol district, which is notoriously liable to heat upon the smallest provocation. It presents naturally all the conditions generally regarded as conducive to spontaneous heating—being close, heavy, containing much fine small, and showing a good deal of pyrites. The paper was well discussed; several members contributing their experiences, which were generally instructive. Coal storing, and coal firing in store, are indeed topics upon which most gas managers in the habit of using soft varieties of coal, can descant with nearly as much copiousness of speech as is evoked by the mention of naphthalene deposits and stopped ascension-pipes. At Weymouth, however, the discussion was kept well in hand. The rest of the proceedings call for no comment. Mr. Irving was elected President for the ensuing year; and the next meeting will be held in Bristol, which should attract a good attendance.

A Proposed Export Duty on Coal.

A CORRESPONDENT comments upon our recent criticism of Mr. Forster Brown's British Association paper on "The "Coal Resources of England," and repeats a suggestion that an export duty on British coal, of at least 5s. per ton, should be forthwith imposed, with the object of keeping the precious mineral for home consumption. He observes that this plan would be preferable to what he regards as our own suggestion for the creation of a National Insurance Fund by the imposition of a coal tax of 6d. or 1s. per ton upon all coal to be hereafter raised in the United Kingdom. We beg to enter a mild protest against the observation contained in the article in question, which is thus referred to by our correspondent, being elevated into the dignity of a "suggestion" for grappling with the case stated by Mr. Forster Brown. We merely put the remark forward as a means of illustrating the difficulty of the case. With regard to our correspondent's plan, it occurs to us that its author can hardly have realized the consequences of stopping the export coal trade of this country. We use the coal cargoes as a means of paying for an infinity of foreign supplies which we could neither do without nor purchase so advantageously in any other way. When a British-built ship sails for India with a cargo of coal (as ballast and currency combined) and brings home wheat, or takes the same cargo to Australia and returns with wool, she is doing a work the wide-reaching influence of which cannot be more than referred to in this short note. No; there is nothing for it but to burn and sell our coal capital to the best purpose. Whether it can be husbanded in a more perfect style under some sort of Government supervision is another consideration which we may have to discuss at a future time. For the present, we cannot admit that the reactionary method of taxing the output would help the country in any true sense.

The Salford Gas Case.—A writ of *certiorari* has been obtained for the removal of the case in which Mr. Sydney Kershaw, coal merchant, of Salford, is charged with attempting to bribe Mr. S. Y. Shoubridge, the Engineer of the Salford Corporation Gas-Works, from the Salford Borough Quarter Sessions to the Central Criminal Court, in London.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 500.

THE course of movements in the Stock Market during the past week has, to a great extent, been a repetition of the preceding period. Speculation has been active, especially in American rails. Prices have had their ups and downs, as realization of profits from time to time checked the advance; but, on the whole, the upward movement has decidedly gained ground. The bright weather has made home lines stronger. Consols and first-class securities, however, are easier. The Money Market remains unchanged; and no demand for gold has yet set in. The Gas Market has been somewhat more active, but not eventful. Changes in quotation are few and slight; and they are also rather irregular. In Gaslight issues, the "A" has been fairly dealt in. It opened at 234 (the closing mark of the preceding Saturday); but on the following day, it was down to 230. From that time forward, however, rather better prices were obtained, although the quotation was lowered one point. Of the other issues, the "B" 4 per cent. was unusually busy, and produced top price. The rest were hardly touched. South Metropolitans were excessively quiet—a couple of bargains in the "B" being all that was recorded; and the figures were not up to the average. Commercials also were only dealt in twice, and at moderate prices. The Suburban and Provincial group furnishes a case of improvement—British having advanced 1; but beyond this, there is nothing to note in them. The Continental Companies have been extremely quiet, and prices are not remarkable; but Continental Union old have made a further advance of 2½. None of the other undertakings furnish anything calling for remark. Water developed much energy on one or two days of the week; and the tendency to improve which was observable in the preceding week was confirmed by an advance in the values of Chelsea, Southwark and Vauxhall, and West Middlesex.

The daily operations were: The opening on Monday was favourable; and prices all round were pretty good, though transactions were somewhat limited. Quotations did not vary. Water was not touched. Tuesday was a quieter day for Gas; and the prices generally realized were scarcely so good. Water moved more freely; and Chelsea, Southwark, and West Middlesex improved 1 each. Wednesday's business was confined almost entirely to Gaslight "A" and "B," the former of which receded 1. Continental Union old advanced 2¼. Nothing was done in Water. Thursday was a quiet day, and prices were not particularly good for the most part; but British rose 1. Grand Junction Water was very active. Friday presented nothing remarkable, except the continued demand for Gaslight "B." Saturday provided about its average business. Prices showed no disposition to move; and all quotations remained unchanged.

Mr. A. Fidler has been appointed Assistant Engineer of the Blackburn Corporation Water-Works, at a salary of £130 a year.

Presentation to Mr. J. Holliday.—On Tuesday, the 25th ult., the workmen employed at the Carlisle Corporation Gas and Water Works presented Mr. John Holliday, the Assistant Gas Manager, with a handsome barometer and an illuminated address on the occasion of his marriage with Miss Mary Jane Baxter, as a token of the esteem in which he is held by them. The happy event took place on the following day.

The Secretaryship of the Pontypool Gas and Water Company.—This position (advertised as vacant in our issue of the 25th ult.) has been filled by the appointment of Mr. T. B. Pearson, who has been for some time Accountant and Assistant Secretary of the Cardiff Gaslight and Coke Company. Mr. Andrew Hair has filled the double post of Secretary and Manager of the Pontypool Gas and Water Company for upwards of 36 years; but the duties of the position have increased so greatly of late years that (at his request) the Directors relieved him of the secretarial duties, and retained his services as General Manager—a sufficiently onerous appointment considering the large extensions now being made by the Company in both their gas and water plants.

The New Chairman of the Manchester Gas Committee.—Mr. Joseph Brooks, who succeeds to the chairmanship of the Manchester Gas Committee, has been a member of the City Council for many years, and, as Deputy-Chairman of the Committee, has gained considerable experience of the department over which he is now to preside. He is not often heard in the Council Chamber; but, on occasion, can hold his own in debate, and in this respect will receive able support from the new Deputy-Chairman, Mr. Robert Gibson. Whether the new heads of the department will initiate any change in policy remains to be seen. In the opinion of outside critics of the Gas Committee's proceedings, there are many directions in which changes must necessarily lead to improvement; but whether the new men will listen to this unsought advice, is open to considerable doubt.

ELECTRIC LIGHTING MEMORANDA.

Mr. R. E. Crompton denies the Modern Improvement of Electric Lighting Plant—The Effect of the Speculation of 1883—The Prospects of Electrical Power Distribution—The Commercial Side of Electrical Industries.

How difficult it is to obtain exact and reliable information on the subject of electric lighting may be seen once more in the voluminous *Times* correspondence that has followed the now celebrated articles on the subject to which reference has been made in this column during the past few weeks. We have noted how Mr. Gerald Massey corroborates the view of the writers in *The Times*, that the Electric Lighting Act of 1882 did far more good than harm by checking the wild speculation in town lighting that threatened to overwhelm the country at the time. When the writer whose opinion is now in question remarked that at that period electric lighting engineering was hardly so far advanced as to warrant the handing over of every important town in England to the companies then existing, most of his readers must have thought that he was merely reiterating a commonplace. If there is anything that the partisans of electric lighting have been agreed upon, in the judgment of an outsider, it has been that in electric light engineering gigantic strides in the direction of efficiency and economy have been taken during the last decade. Yet, in regard to this very statement, the writer in *The Times* has been called to account by no less respectable an authority than Mr. R. E. Crompton, who has declared that "in 1883, the year after passing the Electric Lighting Act of 1882, our knowledge of the subject was sufficient to enable us to design central stations on what is known as the low-pressure system, which in all important respects were absolutely identical with those that have been since designed and carried out." Mr. Crompton admits that since this period improvements have been made in high-pressure systems of electrical distribution, which have enabled electricity to be conveyed over larger areas than could have been dealt with in 1883; but, as a matter of fact, it is the low-pressure system that does most of the lighting of London and other places even now. Mr. Crompton reinforces his statement on this head by asserting that his firm recently carried out, as contractors to the Westminster Supply Company, the very scheme that he prepared for the Edison-Swan Company in 1883 when the Victoria Station experiment was commenced.

Of course, Mr. Crompton's assertions are denied in other quarters. The correspondent of *The Times* writes a long and argumentative letter to show that, even if Mr. Crompton's designs of 1883 can be described as good for 1891, the machinery necessary for carrying them out can now be purchased at a vastly cheaper rate. This writer freely acknowledges that Mr. Crompton has done great things for practical electric lighting, but gently hints that even he was not always perfectly wise in regard to the subject, and observes that even so late as 1886 Mr. Crompton laid at Kensington a system of mains which it was found expedient to replace with others last year. Mr. Crompton in his letter rather "pooh-poohed" the idea that the speculation of 1883 had any great prejudicial effect upon the prospects of electric lighting; but the writer in *The Times* remarks pertinently enough that it would be difficult indeed to overrate the effect, felt even to-day, upon the investing world of the "miserable losses, the scandalous misuse of the money subscribed at that time." He cites the instance of the Metropolitan (Brush) Electric Light and Power Company, Limited, with its nominal capital of a million sterling, one quarter of which was paid for the "concession" of right to use certain apparatus in London. These rights were worthless, inasmuch as they did not cover a dynamo that could supply 100 incandescent lamps; and yet the Company held no less than fifteen Provisional Orders for the supply of electric light over a large portion of the Metropolis. It is asked, pointedly enough, what the 1882 Act had to do with the failure of any electric lighting scheme associated with such a company as this?

It is to be remarked that when the friends of different systems of electrical distribution are disputing the rival claims to pre-eminence of the low-pressure continuous and the high-pressure alternating systems, the former are prone to clinch their arguments by the assertion that it is likely to prove more generally useful than the other, because it can be employed for electric motors, whereas the latter cannot. This plea sounds very weighty, particularly when supported by rhapsodies of the usual order respecting the advantages of electric motors for small industries. It suffers sadly, however, when a brutal critic asks what it really amounts to, in point of fact. Where are the electro motors, even in the districts served by low-pressure electric systems? and Echo, in this case, makes her traditional response. The reason for the non-appearance of the electro motor, as stated by Mr. Campbell Swinton, is simply the gas-engine. When in any large town of the kingdom a gas-engine can be depended upon to generate energy whenever wanted for about one penny per horse power per hour, while at prevailing prices energy distributed by electrical mains costs seven times as much, it seems absurd to reckon the possible distribution of energy among the the elements of commercial success in electric light installations. Gas beats electricity for lighting by about three or four to one in regard to cost; but for power distribution, gas leads by from six or seven to one. This is the case against the electro motor in a nutshell; and it is clear that while such conditions prevail, the rivalry between high and low pressure electricity is not affected by the question of power distribution.

Commercial considerations are the greatest plague of electricians, not only in respect of lighting work but of most other applications of high-power electricity. A company has been formed to work in this country the electrical-welding patents of Professor Elihu Thomson; the technical portion of the scheme being under the nominal direction of Sir Frederick Bramwell. After having stated so much, nothing more remains to be said respecting the practical part of this venture; but whether electrical welding can pay, remains to be seen. A remarkable light was thrown upon the operation of the fatality that seems to attend modern electrical enterprises by the report of the Directors of the Aluminium Company, Limited, which was formed to work the Cowles electrical process of reducing this hitherto scarce mineral. The accounts of the undertaking show a loss for the year of £6174, partly due to the necessity of writing down the value of stock. When the Company was formed, the market price of aluminium was from 60s. to 70s. per pound; and no improved means of producing the article had been introduced for many years. It was calculated that the process which the Company were to work would enable the metal to be made and sold at 20s. per pound—realizing a handsome profit, and of course securing the monopoly of the trade. Alas for the calculation! No sooner had the Company overcome their own initial difficulties, and got their process fairly into working order, than a chemical process for the reduction of aluminium was perfected which has brought its market price down to 2s. per pound. It is the Fortune of War; but it is undeniably hard upon the Electrical Company. They have the consolation of being almost monopolist manufacturers of sodium; but then again, nobody wants all the sodium they can produce. The history of the Company teaches a lesson on the advisability of testing, whenever possible, the permanent reliability of the market prices of products on which the prospectuses of joint-stock manufacturing companies are based.

Alderman W. W. Foord, one of the Directors of the Brompton, Chatham, Gillingham, and Rochester Water Company, was seized with an apoplectic fit while standing on the Sun Pier, Chatham, last Thursday; and he died almost immediately. The deceased gentleman was 64 years of age.

Lunge's Treatise on Sulphuric Acid and Alkali.—We have received from the Publishers (Messrs. Gurney and Jackson), and shall review in an early number, the second edition of Vol. I. —Sulphuric Acid—of "A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches," by Dr. George Lunge, Professor of Technical Chemistry at the Federal Polytechnic School at Zurich. It is some twelve years since the first edition of this section of the work was published; and notwithstanding the omission of a large amount of the matter there included, and which is now to an extent obsolete, the present volume is far more bulky than its predecessor. In lieu of 658 pages of text and 309 engravings, there are now 903 pages of text and 370 engravings (more than 150 of which are entirely new). As to this, the author remarks: "But this does not mean that a corresponding quantity of fresh matter has been simply superadded to the old. Everything has been overhauled; there is hardly a single page as it stood in the first edition; considerable portions of all the chapters, in some cases nearly the whole, have been entirely re-written. This is, in point of fact, a new book, for which the first edition has long served as the principal source of information." It only need be added now that the present volume forms an independent treatise on the manufacture of sulphuric acid; and the publishers intimate that a new edition of the other two volumes completing the work—Soda and Chlorine—cannot be issued for several years to come.

Waverley Association of Gas Managers.—The sixty-first half-yearly meeting of the Waverley Association of Gas Managers was held at Jedburgh on Thursday last. The members and friends of the Association, on their arrival, first visited the gas-works, accompanied by Mr. Taylor, the Manager. On leaving, they held their meeting at the Royal Hotel—Mr. Smith, the Manager of the Rosewell Gas-Works, the President of the Association, in the chair. The Secretary (Mr. G. Taylor) read the minutes of the last meeting, which were approved of. The Chairman then gave a short address, mentioning among other things a system of finding out leakage in mains, which led to a discussion in which Mr. James Black, of North Berwick, Mr. Thomson, of Duns, Mr. Robson, of Selkirk, Mr. Smith, of Melrose, Mr. Taylor, of Jedburgh, Mr. Rutherford, of Aberlady, and Mr. Rutherford, of Earlston, gave their experience. The business over, the members and friends visited the Abbey, the architectural beauties of which were described by Mr. Walter Laidlaw, the keeper. They then dined together at the Royal Hotel; the positions of Chairman and Croupier being filled by the President and Mr. Thomson. In the course of the toast list, Councillor Minto, representing the Jedburgh Gas Company, proposed "Success to the Waverley Association of Gas Managers," giving them a cordial welcome to Jedburgh. Mr. Robson proposed "Success to the Jedburgh Gas Company," which was responded to by Mr. Minto. The next meetings of the Association are to be held at North Berwick on the second Thursday of April, and Peebles on the second Thursday of September, 1892.

NEITHER TRUE NOR BEAUTIFUL.*

When one takes up a book with an ambitious title, and, with a view to doing justice to the author, prepares to read his preface, in order to become possessed of his purpose in writing the volume which he offers to the public "for a consideration," it is slightly discouraging to be told right off that "the following pages are not presented as any contribution to science or literature." The reflection is immediately suggested to the critical reader that, if a book has no claims to respect on the score of science or literature, its field of utility must be painfully restricted. Books that are neither science nor literature do exist; and some of them are such as the world "would not willingly let die." In this category may be placed a whole host of humorous books, to say nothing of cookery books, and publications designed to subserve the interests of "hearth and home" in a variety of other ways. A book bearing the title of "The London Programme" could hardly be expected to be mirth-provoking, however, even if its matter was not known to be hashed up from that remarkable weekly periodical, the *Speaker*, with which no man ever yet associated the idea of humour, save perhaps of the unconscious sort. What is it, then, that being neither scientific, nor literary, nor humorous, the author of "The London Programme" has felt as the compelling cause of his putting forth his modest-looking volume? His preface tells us in words which have the merit of brevity, and do not altogether lack that of clearness. He has a general idea that the administration of the Metropolis needs to be reformed. He is aware of not being singular in the holding of this belief; and he has assumed the part of formularist of a number of points of a creed which he thinks may be described by the term chosen for the title of his book. He, being in all probability a member of the army of journalists who ply the industrious pencil for their living in and about London, and being consequently adept at expressing the results of his own cogitations and summarizing the recorded opinions of others, was encouraged by the Editor of the *Speaker* to write a series of articles for this publication on the subject of the local government of the Metropolis; and he has been so pleased with the aspect of his own work that he has thought fit to republish it in book form.

Mr. Sidney Webb, for so is the author named, is doubtless an able scribe; and the administration of the internal affairs of the largest and richest capital the world has ever known is a subject important enough to worthily engage the attention of all thoughtful Englishmen who love their London as. With all its shortcomings, many Englishmen believe it deserves to be loved. At the same time, there is an air of pretentiousness about the presentment of the views and notions of any one man, or of any party of men, as being not merely *a* London programme, but as *the* London programme, which, to use a familiar but forcible expression, "sets one's back up" against such presentment at the start. Who is Mr. Sidney Webb, or who are his patrons of the *Speaker* coterie, that he or they should assume the right of laying down the lines upon which the development of London administration matters shall progress? Mr. Webb admits that he has no real authority for taking up such a position; but he pleads in extenuation of his presumption "a life-long acquaintance with London, and a very real and deep affection for his native city." The plea is a good one, so far as it goes. It reminds us that of late years many of the loudest and most confident advisers of the London populace in respect of the management of their own affairs have not been Londoners, and that some of them are not even Englishmen. The most conspicuous places in what is called the Party of Progress in the London Governments have been usurped, thanks to the apathy of Londoners themselves, by gentlemen of the Irish-American type, whose ideas of how London should be ruled have betrayed a distinctly alien inspiration which has not commended them to the taste of the majority of the population. An uncomfortable sense of this has made itself felt in the London County Council generally, and especially among the party with whom, by his own admission, Mr. Sidney Webb has had most to do, which has rendered them very uneasy as to the prospects of the next election to this body.

We shall not be far wrong if we look to this feeling for the true motive that has induced Mr. Webb to publish his book. The self-styled Party of Progress in the London County Council are disturbed by the suspicion that the manœuvre by which they managed to obtain the control of the Council for the first three years of its existence will not serve a second time. They protested that nothing of the nature of "political" motives, using the word in its widest sense, should intrude into County Council organizations; and, as a matter of fact, it has become political to the backbone. We do not say that the Council has interfered overtly with partly politics, to the extent of passing resolutions bearing upon House of Commons debates; but it has been very near it on several occasions. Its internal administration, however, has been notoriously based on American methods of party management; and if opportunity had served, this spirit would not have been confined to the working of the Spring Gardens Committees. England is not America in permitting politics to be its own reward to those who call themselves politicians. We still expect our governing and administrative bodies to govern and administer; and the time has come when the ratepayers of London will ask themselves seriously what the Progressive Party of the County Council have done to deserve the name. The result of any such inquiry cannot be very creditable to the party. There is always, however, a way whereby politicians may escape from an uncomfortable retrospect. They can always talk of what they mean to do in the future, if they have the chance; and so, as it appears to us, Mr. Webb has been put up to persuade the people of London that his friends will do great things in the coming time, if they will only accept the promise of his programme as indicating the lines upon which the next County Council are to work.

The initial difficulty which Mr. Webb, in company with all other self-appointed spokesmen for London has had to face, is the utter absence of all municipal spirit from Metropolitan sentiment. Londoners do not care greatly for their Vestries; they did not take much notice of the Metropolitan Board of Works; and they persist in withholding enthusiasm for the County Council. The average Londoner has no ambition to figure as a leader in any self-governing body; and accordingly he declines to admire those who do. The fuss and parade of municipal authority does not impress him; and therefore membership of such an authority does not carry with it any sense of distinction in his estimation. The quiet, unobtrusive management of affairs by a Government office is much more to the Londoner's taste than the ostentation of the Local Board style. There is absolutely nothing in common between the state of feeling in a country town, where it is possible for local sentiment to busy itself respecting the position of a new street gas-lamp, and that of London, where nobody knows or cares what goes on in the next street. London is everybody's care; and, therefore, in a sense nobody's. Every member of Parliament is a Londoner for half the year; and if he sees anything wrong in its affairs, it is much easier for a member of Parliament to suggest redress in the form of a question addressed to the Home Secretary than it is to stir up a Local Board. The standard of London administration must be national, and even cosmopolitan, rather than parochial or even municipal; and so, without expressly formulating their reason, Londoners appear to think. At any rate, they decline to accept the County Council as competent to represent the feeling of the capital.

This unmistakeable sentiment is a grievous disappointment to the more fussy members of the County Council. There is plenty of work for these gentlemen to do, if they will do it, in the useful but unobtrusive Committee duties which but for this body would be discharged by a Government Department. This obscure usefulness does not satisfy them, however. They want to be exalted in public estimation as great men; and when they see that this distinction is denied to them, they want to seize it by main force. They scorn to restrict themselves to the care of streets and drains, and aim at grasping the control of all the public interests of London, as a preliminary to their own aggrandizement. "You don't care much for your County Councillors now;" they say to London—or incite Mr. Sidney Webb to say it for them—"but when we have superseded the Vestries, acquired the water supply, taken over the gas-works, assumed control of the markets, the docks, tramways, hospitals, workhouses, asylums, police, and all the rest of it, what will you say to us then?" That is practically the meaning of "The London Programme," according to Mr. Sidney Webb. We are to pile everything upon London Municipalism, in order to make it respectable. That it ought to be respected in little things first, never occurs to this clever propagandist. To show faithfulness in little things, as a preliminary proof of fitness for the control of greater things, is to him obviously an old-fashioned idea, not worthy of an age of Progress. The possibility that he is putting the cart before the horse in his scheme appears also to escape his perception.

This much for Mr. Sidney Webb's general notions. The views he entertains on the subject of the London Water Supply were mentioned in the Journal last week. His ideas of gas supply constitute the other point of detail in respect of which the book setting out the particulars of his programme touches us. The character of his information on this subject, or the fairness of his mind respecting it, may be gathered from the opening paragraph of the chapter devoted to "London's Gas Bill," which states that "so abundant, indeed, is the profit to the ordinary shareholders, that huge salaries and pensions are paid, and unnecessary renewals executed, merely to avoid returning a large surplus." It may be gathered from this observation that Mr. Sidney Webb's study of the finances of the London Gas Companies sadly wants bringing up to date; but he is not the first Progressist who has declined to learn too many modern facts. But we beg the author's pardon; it is only such facts as he dislikes that he ignores. With regard to convenient truths, he is very much on the alert. He is aware, for example, of the last increase in the price of gas by The Gaslight and Coke Company; but he judges it prudent to take no notice of the true reasons which led to this step. When a writer who confesses to being a Londoner, however, can find it in himself to describe last winter as having been a "mild" one, his case is evidently one that calls for pity more than for criticism. It is just as well, after this evidence of Mr. Webb's

* "The London Programme." By Sidney Webb. London: Swan Sonnenschein and Co.; 1891.

taste in the matter of weather, that the control of the great London climate is one of the few Metropolitan concerns that are left outside his programme. Mr. Webb is hardly, moreover, so safe a guide as might be expected of a gentleman who essays to "set the time of day" for all London, in regard to matters which are less questions of opinion than the quality of last winter's weather. He tells his readers, for instance, that there is only one Gas Company north of the Thames, while there are two other Companies south of the river; but this slip he would perhaps wish us to regard as a mere trifle.

Curiously enough, the statement which Mr. Webb permits himself to make that, in the course of the amalgamation into three of the once multitudinous Gas Companies of London, "all the safeguards of competition have necessarily disappeared . . . and our gas bill is a tyranny tempered only by fear of petroleum or alarm at the progress of electric lighting," does not imply, as a careless reader might imagine, that Mr. Webb is ignorant of the existence of the sliding scale. Further on, he admits that there is some such device in operation, the credit for the introduction of which he ascribes to the late Mr. James Beal. But he is under the delusion that the revenue from residual products does not "enter into the sliding scale." As a matter of fact, however, Mr. Sidney Webb labours under more than one false impression with regard to the matter of gas supply; and one shudders to think what would become of a parliamentary case for the acquisition of the London Gas Companies by the County Council, if presented upon the statements of Mr. Sidney Webb's programme.

That the acquisition of the gas supply constitutes what he would probably describe as a "plank" of this programme goes without saying. In the late Mr. Beal's time, it was tacitly understood that the transfer of the gas supply of London to the County Council was excluded from practical politics. Mr. Sidney Webb has changed all this; and the County Council is to buy up the Companies for twenty-five years' purchase of their annual profits, which, according to his arithmetic, is to result in an additional profit balance of a quarter of a million sterling—to be applied to the reduction of gas bills. Perhaps; but it would, in Mr. Webb's words, "better still, yield a whole Peabody fund every year for the re-housing of London's poor." The prospect is tempting; but if more is required, Parliament is to be requested to bring the Companies to their knees. "Rates of dividend and prices of shares must therefore be dismissed as irrelevant considerations." If the London programme necessitates the repeal of the Ten Commandments, why, let this effete old code go. County Councils must not be hampered by any such old-fashioned considerations. But we have said enough to give our readers a taste of Mr. Sidney Webb's quality as one of the Progressive Publicists, who are, of course, as the salt of the nation. If they like more of him, the book will be found to give it, at a price that must be called cheap. In conclusion, we are free to admit that we have every reason to agree with the author in the statement that his work is neither science nor literature—that is to say, it is neither true nor beautiful. *What* it is, we must be pardoned for refusing to define.

The Recent Examinations in Gas Manufacture.—Our attention has been called to an error in the list of successful candidates at the last examinations in "Gas Manufacture," which appeared in the JOURNAL for the 4th ult. In the Honours Grade, second class, the name Steel, J. J. J., ought to have been Johnson, J. J. S. It should be explained that in the pass-list we received, the name was given as Steel, Johnson J. J. Mr. Johnson is Mr. Weller's assistant at the Southtown Gas-Works, Yarmouth.

The "Transactions" of the Society of Engineers have just been issued for 1890, edited by the Secretary, Mr. G. A. Pryce Cuxson. Besides the inaugural address of the President for the year (Mr. Henry Adams, M. Inst. C. E.) the papers read—seven in number—and the discussions to which they gave rise, are published *in extenso*. None of them were, however, of particular interest to JOURNAL readers. The three vacation visits are described; and there is an interesting obituary notice of Mr. H. P. Stephenson, who was a Past-President.

Society of Engineers.—The first ordinary meeting of this Society after the summer recess will be occupied by the reading and discussion of a paper on "Retort Charging and Discharging Machinery in Gas-Works," by Mr. Henry O'Connor. The meeting will take place at the Westminster Town Hall on Monday, Oct. 5; and the following is a synopsis of the paper: Introduction; Saving in labour; Space required; Size of mouthpieces; Mr. Methven's suggestion; Drawing machinery alone used in some works; Foulis's hydraulic machinery; New drawing apparatus; Rowland's patent; West's systems; Longsdon's stoker and fan rake; Warner's system; The Ross stoker; Grice's conveyor, charger, and discharger; Jefferies' cannon-like stoker; Atterton's manual-power system; Leutz's gravity charger; M'Dougall's continuous system; Cunningham's hand charger; Somerville and Cutler's scoop; Ruscoe's machine; Eitle's charger; Freeman's manual apparatus; Woodhouse's scoop and rake; Sloping retort charging; Coze's system; Morris and Van Vestraut's telescopic scoop; Trewby's division plate; Braidwood's retarded action tipping truck; Hunt's hopper; Henry Woodall's shoot; Conclusion.

NOTES.

The Burning of Gas under High Pressure.

Mr. R. W. Wood has contributed to the American *Journal of Science* an account of experiments upon the burning of coal gas under pressure. It is remarked that anyone who has watched a burning jet of ether vapour will have noticed that, as the pressure of the effluent gas increases, the flame gradually retreats from the orifice, and eventually goes out if the pressure is carried beyond a certain point. Mr. Wood has set himself to investigate these phenomena, using various gases, and observing their behaviour under different degrees of pressure. He found that a burning jet of coal gas was extinguished when the pressure attained 23 centimetres of mercury, at which he computed that the velocity of the issuing gas exceeded the speed of combustion for the gas as mixed with air. Upon this observation it may be mentioned, as a well-known phenomenon, that when coal gas is mixed with air—as when the contents of a gas-main that has been opened are being blown out in readiness for working again—the flame of the ignited mixture is greatly affected by its pressure and the proportion of the two components. The adhesion of the flame to the tip of the discharging-pipe is influenced by the pressure and the composition of the mixture; and this consideration may be referred again to the basis of computation employed by Mr. Wood.

Mr. John Aitken on Cloud and Fog.

Mr. John Aitken, F.R.S., has been further prosecuting his researches into the physical formation of clouds and mists, which have been noticed from time to time in the JOURNAL. He recently read a paper on this subject (which he has made his own) before the Royal Society of Edinburgh, giving the results of observations of mountain and valley air in Switzerland, taken by the aid of his apparatus for counting dust particles in the atmosphere. The conclusion to be drawn from some of these observations is that there is much circulation of air between high and low elevations; the lower air being naturally more full of dust. A remarkable statement made by Mr. Aitken was to the effect that, while everything on the surface of the earth was perfectly dry, tbe fog-counter showed that fine rain drops were falling in immense numbers. The observations with the fog-counter indicated that the density or thickness of a cloud depends more on the number of water particles than on the number of dust particles in it. On comparing the thickness of a mountain cloud with that of a fog at a low level, when the number of water drops was about the same, it is found that the fog, although thicker, was not greatly so, although there were only a few thousand dust particles per cubic centimetre in the cloud, whereas there were about 50,000 of these particles per cubic centimetre in the fog. While upon this subject, it may be noted that the Committee of the British Association appointed to experiment with Professor Lodge's method for the dispersion of fogs by the electrification of points, have presented a brief report, which, however, seems to have deferred dealing with the practical question.

Refrigeration from Central Stations.

There are undertakings in operation in different parts of the world for the distribution of gas, water, air, electricity, and steam by means of underground pipes; and now the category of pipe-delivery supply systems has been further extended by the addition of an automatic refrigerator system, which is actually being worked at Denver, Colorado, where it has been established for two years with, it is claimed, complete success. On general principles, a central station cooling-plant is as intelligible as a heating-plant of the same class; and if the latter is found efficacious in warming cold localities with convenience and economy, the former may be supposed to have an equal scope in the other direction. Originally (according to a statement of Mr. Haws to the American Society of Civil Engineers) the Denver undertaking was started for the purpose of making ice for sale. Next a contract was taken to supply refrigerant to a cold storeage warehouse adjoining the ice-making machines; and from this to supplying refrigerant through mains to subscribers was an easy and natural step. The ammonia process of producing cold by evaporation is used. The distributing system consists in forcing the ammoniacal liquid—29 parts of pure ammonia to 71 parts of water—through the main to the point where refrigeration is desired; suddenly increasing the space at that point, so that evaporation may quickly ensue; absorption of the liberated gas by water, to return on a suction line to the central station; the re-distillation of the ammonia; and the removal of heat during this stage. The system is practically automatic; and when once started the apparatus runs continuously, without loss, save by accident. In March, 1889, the Company started the plant, consisting of one 30-ton ice machine, about 2 miles of mains, and the cold storeage warehouse. The main is only 1-inch gun-barrel tube, and will convey enough fluid to refrigerate 150,000 cubic feet of space. The valves open 1-64th of an inch only into grid-iron refrigerators placed underneath the ceilings of the cold rooms, at the other end of which is a return connection to the 3-inch main leading back to the works. The public greatly appreciate the cold service, which is charged for upon the same principle as the steam-heating companies adopt—at so much per unit area of exposed surface and openings

TECHNICAL RECORD.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting of this Association was held last Tuesday at Weymouth, under the presidency of Mr. S. W. Durkin, of Southampton. Weymouth is one of the favourite seaside resorts of the people of the south-west; and consequently, the early morning promising for a fine day—as it proved to be—there was a good attendance of members and friends. Before the business meeting commenced, some of the members visited the gas-works, where it was seen that the Manager (Mr. James Lowe) has greatly improved portions of the plant, and is busy preparing for the coming winter's work. By the kindness of the Directors of the Company, luncheon was provided at the offices, where the meeting was subsequently held.

A Welcome to the Town.

The President, having taken the chair, introduced to the members the Chairman of the Gas Company (Mr. Alderman Thomas) and one of his co-Directors, Mr. Alderman Robbins.

Alderman Thomas said he wished to express the pleasure the Directors felt at the Association selecting Weymouth for their meeting that day. It was to their Manager (Mr. Lowe) that they owed entirely the success of the Company; and any compliment paid to him was always much appreciated by the Directors. The Company was only a small one; and he did not know that they could show the members very much at the works, or in their surroundings. However, he believed they stood in a unique position in one respect. The main that supplied the larger number of the consumers passed under an enormous volume of water, or tidal wave. The late proprietor of the works used to regard it as the pride of his life that he was the first person who laid a gas-main under a huge tidal wave. Directors and managers of gas companies, he proceeded to remark, were now in times of severe competition—on the one hand they had oil to contend with, and on the other the electric light. In his opinion, the latter was making very rapid strides; and it was incumbent upon them that they should set their house in order to meet that competition. The labour difficulty, too, had been a serious matter with many gas companies; but happily in Weymouth they had experienced nothing of the kind. The best feeling had always prevailed between the Directors and their employees; and this again was due to their worthy Manager. In small companies they could not establish funds for the benefit of their workmen like the large companies; but it had occurred to him whether they could not promote life premiums, or something of the kind, aided by subsidies from the companies themselves—whether they could not give the men some interest in their work, which would prevent them being led off by demagogues. This, it appeared to him, could not be done in one place like Weymouth; but it might be done by a combination of small companies in a district. He did not think he ought to detain the members by dwelling on this matter; but should at any time such a course be adopted, he believed it would add to the stability of the companies by giving the men more interest in their work. In conclusion, he repeated that it afforded him great pleasure to welcome the members to Weymouth.

Alderman Robbins having also expressed the gratification it gave him in meeting the members,

The President said that, on behalf of the Association, he had to thank the Chairman and Alderman Robbins for the kind words they had uttered in welcoming the members; and he could assure them that they were always very glad to come to Weymouth. It was some years ago since he visited the town to assist in the formation of the Association; and he believed it almost took its birth there.

Minutes of Last Meeting.

On the suggestion of the President, the minutes of the last meeting were taken as read.

A Vote of Condolence.

The President said that the next business was the passing of a vote of condolence to the family of their late friend, Mr. Henry Cockey; and the resolution he had to propose was as follows: "That this meeting desires to express a feeling of sincere regret on the decease of the late Mr. Henry Cockey, and to record the great esteem and respect entertained for that gentleman as one of the founders and Past-Presidents of this Association; also to convey a vote of sympathy and condolence to his surviving relatives."

Mr. T. Hardick (Salisbury) seconded the motion; remarking that Mr. Cockey had been connected with the Association for a great many years. He claimed to know him well, as, in his early days, he was at school with him at Frome. One who was associated with them so honourably and from the outset deserved their esteem and remembrance. He was always ready to assist anyone who felt weak; and he (Mr. Hardick) did not think they could do better than express to the family—and this they did in the words of the resolution—how highly they all respected him.

The resolution was passed by the members silently rising.

Annual Accounts.

The Secretary and Treasurer (Mr. Norton H. Humphrys) then presented his statement of accounts for the twelve months ending the 31st ult.; and these showed that, after meeting all expenses, there was a balance in hand of £18 10s. 2d. Mr. Humphrys took the opportunity of calling attention to the number of subscriptions in arrear, and asking the members who had not sent in theirs to assist him by doing so as early as they conveniently could.

On the motion of the President, seconded by Mr. T. W. R. White (Sherborne), the accounts were adopted.

New Members.

The President then proposed, Mr. A. V. Daniel (Portishead) seconded, and it was unanimously agreed, that the following gentlemen should be accepted as members of the Association: Mr. J. Robb, of Cinderford; Mr. P. Brace, of Monmouth; Mr. W. Stagg, of Bristol; Mr. F. Vince, of Trowbridge; and Mr. W. Lowe, of Weymouth.

Election of Office-Bearers.

Messrs. W. H. Brinkworth (Chippenham) and T. Giles (Bridport), who had earlier in the proceedings volunteered to act as Scrutineers of the voting-papers for election of officers, presented their report. It showed that the following gentlemen had been elected to the various positions:—

President.—Mr. D. Irving, of Bristol.
Vice-President.—Mr. E. C. Riley, of Swindon.
Hon. Secretary and Treasurer.—Mr. Norton H. Humphrys.
Auditor.—Mr. W. Higgs, of Basingstoke.
Members of Committee.—Mr. J. Nicholls, of Crewkerne; Mr. W. Parlby, of Hereford; and Mr. F. Osmond, of Dorchester.

Mr. Irving said he wished to thank the members for the great honour they had done him in electing him to be their President. He took the position with considerable misgiving, especially when he remembered the long list of able and experienced gentlemen who had already occupied the chair. He could only say that he would do all he possibly could to make the Association useful and profitable to the members; and he hoped the latter would do all they could to assist him in that object.

Mr. Riley also thanked the members for selecting him as Vice-President. At the same time he confessed that he almost thought his election was a reflection on their wisdom—at any rate it seemed to him they had overlooked higher claims to the post than he had, seeing that he was comparatively a young member.

A Few Remarks from the President.

The President said he saw by the *agenda* that he had to make a few remarks. He would, in the first place, say he had been thinking of giving notice of a resolution to alter the rule as to the spring meeting, so that it might be held a little later. The latter part of March came just prior to the spring meter-taking; and so, if they altered it, they must fix a day which would be convenient to the members after that work was over. Whether they would care about making the change, he did not know; but it seemed to him that the weather was never favourable at the time they met in the spring, besides which they now had hardly got through their winter labours before they had the Association work upon them. He did not propose to give the members a second address on the present occasion, as he considered that one was quite sufficient in a year's office. There would have been ample matter to have based an address upon; but he thought they would prefer having the present meeting more as a social gathering than the spring one. He might say, however, that in gas manufacture a sort of revolution was now going on. Whether the cumbrous methods now in use would be continued, it was not for him to say; but there was evidence of other means being adopted to generate a large volume of gas in a much simpler manner than they were in the habit of doing at the present time. Before concluding, he would ask the members to support Mr. Irving during his term of office. He was glad to find they were starting the year with a good number of new members; and he trusted the old members would not fall off. Mr. Irving had himself introduced three of the members who had been elected that day; but in the district where he (the President) lived, they had not any small gas-works, as the Southampton works covered the ground for many miles round.

Place of Next Meeting.

It was decided, on the motion of the President, seconded by Mr. White, that the next meeting should be held at Bristol.

Mr. D. Irving then read the following paper, entitled

THE STOREAGE OF COAL IN GAS-WORKS.

The subject of storing coal in gas-works has for some time been engaging the attention of gas manufacturers, and is one of such importance to every member that I trust no apology is needed for bringing it before this Association.

It is doubtless the sincere aim of all gas engineers and managers to produce and deliver to the consumer good and cheap gas at the least possible cost; but it must be remembered that one of the first duties of the gas manufacturer is to provide a supply that shall be, above all things, reliable. In these days gas not only cooks our food, warms and illuminates our homes, but supplies the motive power and light for many large and various industries. It is, then, of the utmost

importance to foster and develop our business in these new and desirable directions. We must be prepared to almost guarantee an absolutely regular and uninterrupted supply; and if this is to be done under all circumstances, it will be necessary to maintain a much larger stock of coal at the works than has hitherto been the case in many places.

There has never been a time in the history of gas manufacture, when a more constant, watchful, and wise attention was necessary on the part of those responsible for the successful conduct of the works. Especially is this true in regard to the proper storing of the raw material, and maintaining a reserve that shall place us in such a position that we shall be prepared for almost any emergency, at the colliery, in transit, or in our own works. It is generally urged against the proposal to provide adequate coal-store accommodation that the necessary sheds are expensive, the additional labour entailed costly, and the deterioration of the coal a serious matter. Whatever differences of opinion we may have upon these three several points, there is no question but that some stock of coal is necessary in every works. Our circumstances and surroundings are so various that no hard and fast rule could be laid down that could be applicable to every works; each manager or engineer must judge, and is best able to judge, of his own requirements. The general agreement, as to the necessity of ample storeage accommodation, of all the various members of the profession who have recently written or spoken upon this subject is striking. Mr. Newbigging some time ago stated that he had been in the habit of recommending, as a general rule, the laying in of a six-weeks' stock of coal, reckoned on the basis of the mid-winter rate of consumption; and this rule seems to find general favour. Six weeks' storeage, upon Mr. Newbigging's basis, equals about 20 per cent. of the coal received during the whole year, and would be equivalent to between three and four months' summer consumption. The question as to what is an ample and safe stock of coal will entirely depend upon the position and circumstances of the works in question. A works situated near or between two or more coal-fields, and drawing its supplies from each, and having more than one railway company upon which to depend for its supplies, would be able to work, and work safely, with a much less reserve than works situated some distance from the coal-fields, or works depending entirely upon sea-carried coal. Under the first-named circumstances, a reserve of about 10 per cent. of the annual amount carbonized might be considered a fair reserve store.

There is, it must be admitted, with many managers burdened with excessive capital, or having heavy working expenses which they are anxious to reduce, a great and natural reluctance to provide the necessary and desired covered accommodation, or yet even to store their coal in the open, because of the common experience that coal so stored rapidly deteriorates. They struggle on from hand to mouth, choosing rather to bear the worry and strain, in order that they may produce gas which shall be at once cheap to the consumer, and remunerative to their employers.

The respected President of the Southern District Association of Gas Engineers, in his presidential address this year, in stating his experience of coal stored both under cover and in the open, gives his preference, in the matter of disposition to heat, to that stored under cover. He remarked, however, that his coal-stores might possess some inducement for the coal to heat, from their relative position to the retort-house, where the temperature is much higher than in the open.

The causes of heating are due to the chemical changes of certain substances—such as iron pyrites, and other sulphur combinations, with the oxygen of the atmosphere in the presence of moisture. Professor Vivian B. Lewes, in a paper on the spontaneous ignition of coal in ships and stores, read before the Institution of Naval Architects,* gives the results of some comprehensive inquiries, and explains the cause of fires in coal cargoes, clearly demonstrating that the heating of the coal is due to its tendency to absorb oxygen in the presence of moisture. He shows that a coal in bulk, which contains much freshly-broken small, has a considerable power of taking up moisture, and is far more likely to heat and fire than a drier coal, even if the dryer coal should contain a larger quantity of pyrites. The learned Professor proposes to distribute cylinders of compressed carbonic acid, secured by a fusible plug, throughout the bulk of the coal. The suggestion was not very favourably received, but was, to use the Professor's own words, "dropped upon." Experience has proved that, to store coal for any length of time, it is absolutely necessary that it should be as dry as possible when stacked. How is it possible to accomplish this in the open? It has been found that two or three wet days during the time that the coal was being stacked was sufficient to cause heating, and to endanger the whole stack of 6000 tons of Bristol district coal. No other part of the stack heated, excepting the particular portion exposed during the rain in question.

Another reason for storing coal under cover is that the water absorbed when in the open has to be paid for at the same rate as the coal for carbonizing. Exposed coal has been known to take up as much as 10 per cent. of water, in addition to its natural, or ordinary moisture. Coal containing (say) 5 per cent. additional water will, of course, increase the cost of carbonizing 5 per cent., which works out at 1·8d. per ton where the carbonizing costs 3s. per ton. The smaller the coal, the greater will be its power of retaining moisture. Bristol district coal, stored for three months in the open, has been found to depreciate over 10 per cent. The advantages gained by having and using dry coal, together with the increased work done in handling coal under cover, not to speak of the duty of protecting our workmen, will fully repay the cost of covered sheds. What is required in storing coal, either in the open or under cover, is that the coal should be fairly dry when stacked, and that it should be well ventilated. Wet coal will fire whether stacked in the open or under cover, if there be but sufficient bulk. It has been found that a coal with an exceptional tendency to heating will not fire, even if wet, if placed in a stack of not more than 6 feet deep. Coal in stores should be well ventilated with shafts placed every 10 feet, so as to prevent or check the first tendency towards heating. Inadequate ventilation is worse than no ventilation, because, if there is any tendency whatever to heating, it only serves to supply oxygen, and help the destruction of the coal. It is desirable to have an intelligent arrangement of coal-stores, so that a regular system of working the oldest coal first can be carried out. If coal is being stored which is likely to heat, a number of 1-inch pipes should be inserted throughout the stack, into which a thermometer could be lowered and the temperature taken daily. Whenever any indication of heating was found, the coal from that particular part should be used at once. Another system, to which attention was called by Professor Elgar, and recommended for consideration by the JOURNAL OF GAS LIGHTING, and which is understood to be compulsory in vessels carrying coal under the American flag, is that of having a number of steam-pipes—about 2 inches in diameter, and perforated with a number of ¼-inch holes—placed vertically throughout the coal. These pipes would also be available for taking the temperature as previously suggested. In case of heating, a flexible steam-pipe connection is attached at the end of the pipe nearest the heated coal, and steam blown into the suspected region. This system may be of some service if a considerable temperature has been attained in the coal, or if the steam could by any means be again conducted out of, or through the coal, then the large capacity of steam for heat might be utilized; but if the steam is to condense in the coal, would not the large amount of heat introduced be a source of danger? If it is a question of reducing or checking the action in the first stages of heating (and this is what should be aimed at), would not the danger to be apprehended from the large amount of latent heat introduced in the steam constitute an overwhelming argument against its use? It is well understood, of course, that there is no such thing as spontaneous combustion in connection with coal stored either in ships or stores. The heating in all cases extends over some time. The arrangement with iron pipes into which the thermometer is lowered enables the condition of the entire stock to be kept under daily observation. It will rarely be found, even with the most active coal, that the temperature will exceed a rise of over 3° C. in the 24 hours—that is, in the first stage.

It has been suggested, and in some few works carried out, that coal should be received at the gas-works in equal monthly deliveries. This course has been very eloquently advocated by Mr. C. E. Jones, the able and accomplished Engineer of the Chesterfield Gas and Water Works, who says: "I am convinced that it is to the best interests of the gas industry to prevent, or reduce to a minimum, colliery strikes; and one undoubted means of so doing is the equalization of the output of coal." Take a works carbonizing 15,000 tons per annum. This works would require, under the equal monthly delivery arrangement, about 4170 tons of coal per month; and from March to October 66 per cent. of the year's coal would be received but only 50 per cent. carbonized. During the remaining four months—from November to February—34 per cent. would be delivered; but 50 per cent. of the whole year's coal would be carbonized. Under the general rule given by Mr. Newbigging of providing accommodation of six weeks' maximum carbonization, there would be, at the end of February, in the works cited a reserve in the stores of 4 per cent., or about 2000 tons, to which must be added any further margin of safety that local circumstances may require.

The cost of the stores as here set forth, including the apparatus for unloading and handling the coal, could be erected for about 40s. per ton, which, reckoned at 5 per cent. interest, and adding 2 per cent. for depreciation, gives an annual cost, which works out at 6·72d. per ton of coal carbonized. Mr. T. O. Paterson, of Birkenhead, states that he has taken deliveries during the summer months for September consumption, and that in one case he had obtained a reduction of 6d. per ton for coal so taken; but he thought the reduction was not sufficient to cover the loss entailed by storing coal for so long a period. If gas committees and companies could make any arrangements whereby the coal-owners could equalize the working of their pits and the time of their workmen, there ought to be no difficulty in obtaining a reduction of 6d. per ton on coal taken upon any such terms. It is not contended for one moment that there would be no deterioration with coal stacked in covered stores; but it is contended that coal mined and stored under the conditions named would not deteriorate more than coal exposed for the shorter periods during the winter months. It has been aptly stated that "coal is better mined, better transported, and delivered in better condition in summer than in winter." Can

* See JOURNAL, Vol. LV., p. 645.

it be maintained that coal delivered and housed in June will turn out worse at Christmas than coal that has been raised wet, and delivered into the retort-house in sloppy, wintry weather? And since, all things being equal, it is easier to make gas in the summer than in the winter, would it not equalize matters if the coal which has been longest in store, were used in spring or summer, leaving the fresher dry-stored material for the winter's make? During the past two months, the rainfall in the Bristol district has equalled the extraordinary amount of 11·47 inches—equal to 4·77 cwt. per square yard, or 1155 tons per acre.

It is remarkable how little care and attention are given to the coal in some works. We are charged at times with being very unscientific in our methods. Picture to yourselves the condition of coal in works—and there are some—where every pound of coal used has been more or less exposed to the recent heavy rains, and where the small coal could scarcely be distinguished from road mud. Under such circumstances, surely little argument will be required to prove the advantage of well-arranged and ample coal-stores. After every provision has been made for suitably storing coal, and every preparation made for handling the same at a minimum cost, the greatest care and firmness will be required to prevent the coal contactor from using for his own convenience that which has been provided for yours. Alderman Miles has publicly stated that at Bolton they were well provided in the matter of coal-stores; and notwithstanding all the provisions they had made, they were reduced, in the winter, to something like 24 hours' supply; and this is not a solitary case. The contract specification should be clear and distinct; and, as far as possible, nothing should be allowed to interfere with the contract arrangement of deliveries.

In conclusion, the question is inevitably one to a considerable extent of profit and loss. Yet there are other important considerations to be kept in view—the security of supply to our consumers; the duty of providing protection for our workmen; and perhaps the collier, who is so often struggling for a larger share of the profits obtained from the coal he wins at the risk of his life, is entitled to our consideration.

Discussion.

Mr. T. Stone (Weymouth) said that some years ago they had a large amount of Somersetshire coal in store—he forgot how much there was; but he thought about 600 or 700 tons. As far as his knowledge went, the coal was put into store in a very good condition, to a depth of from 14 to 16 feet. It had not been long in store before he observed, by the odour, that there was something amiss. The shed in which the coal was stored was an inexpensive one, and was supported by wooden baulks. He discovered on the occasion referred to that the timber was burning; and he had the coal removed to a considerable depth—he believed he got down about 10 feet, and there he found live fire. How far it extended, he could not judge; but he poured an immense quantity of water on the coal to extinguish, as he hoped, the flames prior to removing it entirely. However, the fire still made some headway; and finding it was yet alive the next day, he had the side of the store completely knocked out, and a large quantity of perfectly live fire was carted away. The whole was removed without any very great detriment to the Company; and as far as the balance-sheet went that half year, one could not discover that there had been anything amiss. He did not believe the coal was damp, as it had been stored in a dry condition.

Mr. Irving asked whether Mr. Stone could say what amount of moisture was contained in the coal.

Mr. Stone replied that he could not.

Mr. Nicholls (Crewkerne) said he had had a little experience in connection with the question of spontaneous combustion. In his case, the coal was taken into store in the middle of the summer. They had in store about 350 tons at a depth of 12 feet. The store adjoined the retort-house, being divided by a wall 2 feet thick, on the inside of which the coal was built up 1 foot away. Strange to say, the fire did not occur there; but in the opposite corner. He had at the bottom about 40 tons of one sort of coal, next 300 tons of another kind, and then on the top 20 tons of small coal. It was stored in this way so that they might make their own "through and through." Before the end of July of that year, they had in store almost a whole twelve months' supply; and the coal was not touched until the last week in December or the first week in January. They did not discover any smell coming from the coal until about 24 hours before they saw the flames on the top of the heap. He worked all round the wall, and found fire the whole distance. The men took out coal seemingly as good as it was the first day it was delivered; and when it was put into a barrow, it was found to be a whole mass of fire. They wheeled the coal out and tipped it into the snow, and then used the larger portion of it in that condition. Some of it they were obliged to throw away; but fortunately the coal was insured.

Mr. T. Hardick said that he had not had much experience in the firing of coal. When he first began gas making, they used all small coal, from which they realized only about 5000 cubic feet per ton. But afterwards his supplies turned out more advantageous; and they then obtained more than double the quantity out of it. After this he found a little firing occurred; but this was not under cover. For many years since then, he had used up all the small coal in the summer with an extra retort, piling up the lumps in the open; and the result had been that he had never experienced any difficulty. He did not remember what was the yield from the large lumps stored outside; but he recollected that he suffered by having a great deal of soft coal mixed with it. If managers of small works would adopt the plan of using the small coal in the summer, and stocking the large lumps in the open, they would never be troubled with firing.

Mr. Stone said he wished to mention that he had the wooden supports of the roof of the coal-store he had alluded to taken out; and they erected brick shafts to ventilate the place. These acted admirably for the coal then used; but they soon resorted to north country coal altogether, and he never experienced such trouble again.

Mr. J. Lowe (Weymouth) observed that his experience of coal heating was very limited; and the remarks he had to make would bear upon the paper read by Mr. M'Gilchrist at the last meeting of The Gas Institute at Carlisle. That gentleman suggested that, in order to extract the moisture from the coal, flues should be constructed from the retort-bench, under the coal-stores, to the chimney-stack. Now he (Mr. Lowe) had found that the heat coming through a 21-inch wall had been the cause of the only instance he had had of coal being set on fire. The coal he then generally used came from the Radstock district; and it was placed against a wall, on the other side of which was a boiler-shaft. He had stacked coal against the wall for months; and they never before had the slightest inconvenience. In this case he was driven to use Somersetshire coal; and the heat produced by the boiler-flue on the opposite side of the wall induced it to catch on fire. He advised managers who used Somersetshire coal to avoid anything like heat in the proximity of the store.

Mr. N. H. Humphrys (Salisbury) said that spontaneous combustion appeared to be rather a mysterious thing. They found it happening in several other substances besides coal—such as oil waste, hay-ricks, and things of that sort—in fact, in any organic matter. With regard to coal, they had been accustomed to assume that it had been due to the pyrites or sulphur in the coal. The Somersetshire coal was almost free from sulphur in any form—more so perhaps than any other coal. He did not suppose there was more than 1 per cent., or 1·2 per cent. of sulphur in it in the way of pyrites or anything else; so that he did not think the sulphur theory accounted for the spontaneous combustion of that class of coal. Then, again, on the point of moisture, they had heard Mr. Stone say that he stored his coal quite dry. He (Mr. Humphrys) was of opinion that spontaneous combustion began in the case of coal that was in a finely powdered condition. Among other things, he had been in the habit of dabbling in chemistry a good deal; and he sometimes made powders which caught fire when exposed to the air. To make one of these powders, they had simply to get a metal finely powdered; and then take any organic salt—such as oxalate—that would burn on the application of heat. On putting these into a tube, and heating it, the salt would burn, and leave the metal behind in a state of very fine division. It was really the same with regard to coal. Some portions of it got crushed into a fine powder; and it was when in this condition that combustion commenced. Thus the really practical point they had to think of was how to keep the dust out of the way in the coal that was stacked. At the same time, fortunately, spontaneous combustion did not happen very often; but it was more or less likely to occur. If, therefore, one had a large heap of coal, and could insure it, it was a very wise thing to do.

Mr. W. Davis (Poole) said that Mr. Hardick had rather encouraged him to speak; because he was under the impression that the remarks he should make would be so much against theory that the members would scarcely believe his statement to be correct. His experience had been with South Wales coal—the Glynos coal. At one time they had their coal through a contractor, and then it was delivered into the store as required. But when the Corporation acquired the works in 1872, they purchased their own railway-waggons, and then bought the coal at the pit. These waggons had to do their work both in summer and winter. They were not equal to conveying the quantity required during the winter, but they could bring in considerably more than was needed during the summer. Their coal-store would only contain about 200 tons; and this was a very trifling amount, with eight 10-ton waggons running generally twice a week. The consequence was that a large quantity had to be stored out in the open, and exposed to all weathers. It was piled up about 8 feet high against a wall, and covered a very large area. As fresh coal came in, it was packed up on the face of the heap, and it was worked away from the face; so that the coal that was stacked first remained there for at least three years, until the new gas-works were built. Although the coal had been stacked in this manner all that time, he failed to find any appreciable difference in the quantity or quality of the gas produced from it—the yield being (using from 3 to 3½ per cent. of Curley cannel from North Wales, or some other cannel) 11,186 cubic feet of 14-candle gas per ton.

Mr. E. C. Riley (Swindon) remarked that the one point which seemed to be dealt with by the members was that of spontaneous combustion. He was happy to say that he had had no experience in that direction. It appeared to him the practical question for them as gas managers was the one mentioned by Mr. Irving in the latter part of his paper—viz., that of pounds, shillings, and pence, or whether it was worth while or necessary

to provide covered coal-stores for a sufficient quantity of coal to meet any variation in the delivery, or as an adequate reserve for the requirements of winter. Mr. Irving had named 6d. per ton on the amount of coal carbonized as covering the cost of proper coal-stores; but he (Mr. Riley) thought they should add to that 6d. per ton for putting the coal into the store and taking it out again. This brought them to the question as to whether the expenditure necessitated in the provision of coal-stores was repaid by the additional value of the coal as stored in covered and properly-constructed buildings as against coal stacked in the open. In connection with this question, of course the quality and character of the coal was important. A great deal of allusion had been made to Somersetshire coal. During the past winter, a considerable quantity of this coal was provided at one of the Great Western Railway Gas-Works to meet emergencies. This stood simply as a reserve in case of any difficulty in the supply; and when they were well into the spring, they determined to use the whole of the stock, so that fresh coal could be obtained during the summer for next winter. Before using the coal, his assistant (Mr. J. Faulkner) specially tested some of it; and the result showed a loss in value of nearly 10 per cent. But when they came to use the bulk of the coal, they found that the loss had only been a little more than 3 per cent. This difference no doubt resulted from the coal which had been tested having been taken from the outside of the heap. The question, therefore, came to this (especially if there was any difficulty in getting the necessary capital), Was it not as profitable to store the coal in the open, taking care to avoid putting in too much small, as being committed to the expense of a coal-store? He should like to ask, in conclusion, whether Mr. Irving was in a position to give any information as to the machine Mr. Trewby had recently called attention to for putting coal into store and taking it out again when required.*

The President said that some years ago he had a little experience of coal firing; and he found that the odour which arose during this so-called spontaneous combustion was one which would never be forgotten. In this instance, the coal was stored to the depth of about 14 feet. A portion of the coal-store ran to the end of the retort-house; and the heat from the benches was conveyed from the retort-house wall to the end of the coal-store; and just in that corner the ignition partially took place. The coal was removed; and a hollow wall was built with air-ducts right through it, so as to have a stream of cool air passing. Not very long since he found a similar thing taking place; but in this case, the coal was a "stray" cargo (which they were glad to take during the severe weather); and there was a good deal of charcoal in it. Close behind where this coal was stored was a stove by which the men cooked their food; and the heat conducted through the wall was the means of partly heating the coal. He was not able, without going to a great deal of expense, to use his coal-store in the summer months, as it was a good distance from where they wanted to use the coal; and therefore he did not feel warranted in spending money in wheeling it. Where coal was stacked, and not used, they always made it a point to drive down ¾ or 1 inch pipes, and to withdraw them once a week to ascertain whether there was any increase in the temperature. With regard to having coal in the open, he had an instance where 500 tons were stacked outside; and the supplies coming in more regularly than was anticipated, this heap was not worked off till the summer. He was surprised to find how little moisture had penetrated into it; for about 8 or 9 inches down it was damp, but inside it was perfectly dry.

Mr. Irving, in replying upon the discussion, said he thought it must be admitted that the storeage of Bristol district coal required very great care, whether in the open or under cover; but the question of using local coal, or coal from another district, was entirely one of profit and loss—it must be decided by every manager for himself. Mr. Humphrys had dealt with the cause of the heating of coal; and as to his remarks about the sulphur contained in Bristol district coal, he generally agreed, except that the total sulphur ran a little higher than he mentioned. He (Mr. Irving) did not think that the heating was due entirely to the sulphur; and he believed it took place in the small coal in the presence of moisture, and that the sulphur compounds were the first to ignite and fire the coal. What he suggested in the paper was not so much how to prevent the heating, as how to detect it. He could scarcely understand coal bursting into flame, without there being something to attract attention previously. His experience concurred with that of the President—that heating took place in coal even when in the open, and that anyone moving about could not fail to detect it. With regard to the additional handling of the coal, there were very few works where the whole amount required could be put down just where it was wanted for carbonizing. It must be lifted once; and if the coal-store was convenient and well arranged, this could be done without any extra cost. With reference to the coal machine referred to by Mr. Riley, he was afraid it could not be used except in very large works. What he contended in the paper was shortly this: That coal stored under cover would in the end be cheaper, and produce better results than if it was left exposed in the open.

On the motion of the President, seconded by Mr. Hardick, a vote of thanks was passed to Mr. Irving for his paper.

* See Journal, Vol. LVII., p. 884.

Votes of Thanks.

Mr. Riley proposed, and Mr. Nicholls seconded, a vote of thanks to the Directors of the Weymouth Gas Company for the kind reception they had given the Association.

The proposition having been carried,

Mr. White moved a resolution thanking the President for the able manner in which he had conducted the affairs of the Association during the past year.

Mr. E. Howell (Yeovil) seconded the motion, and it was unanimously agreed to.

The President heartily thanked the members for their cordial vote of thanks; and concluded by proposing that a similar compliment be paid to the Hon. Secretary and Treasurer, and also that a honorarium of ten guineas be voted to him for the additional work, which has lately fallen upon him.

Mr. Irving seconded the proposition; and it was carried.

Mr. Humphrys briefly acknowledged this kind recognition of his services; and the business proceedings then terminated.

The members and friends subsequently dined at the Victoria Hotel; and later in the afternoon, they had a sea-trip by a specially-engaged steamboat. Altogether the day was a most successful and enjoyable one—attributable in great measure to the assistance given by Mr. Lowe in making the arrangements.

The Pintsch System of Railway Carriage Lighting.—In their last week's "Railway Memoranda," *Engineer* says: It does not appear that the electric lighting of railway carriages has yet reached a satisfactory, practical, and commercial stage. The London, Brighton, and South Coast Company has had the system in use for some years, and with a certain amount of success as far as getting a light and running a light is concerned; but it is quite clear, that, from a practical and economical point of view, it is inferior to lighting by gas. We learn that the Company has decided to adopt the oil-gas system of lighting (Pintsch's system), and that a large oil gas-works is to be built, and about two hundred carriages are to be fitted at once. Safety, certainty, economy, and very small amount of attendance required by the carriages lighted on this system must, of course, explain the choice of it by railway men, who have to secure the best possible thing at the lowest cost consistent with the highest efficiency. When we remember how very rapidly the system of the Pintsch Lighting Company is being adopted in America, we need not be surprised to find that it is deemed preferable to electric lighting in this country.

Gas-Works in Denmark.—According to recent statistics, there are in Denmark, says *Industries*, twenty-eight gas-works, which are in the hands of various corporations; eight are the property of the Danish Gas Company, one belongs to a Syndicate, and others are owned by private persons. The production of the municipal gas-works amounted last year, in the aggregate, to 894,979,000 cubic feet, which shows an increase of about 4½ per cent. The largest consumption of gas per inhabitant was in the town of Nakskov, with 3710 cubic feet per individual; in Copenhagen the consumption was 2150 cubic feet; and Korsöv is at the bottom of the list, with 1019 cubic feet per individual. The price of gas appears to be declining. The number of lamps of the various municipal gas-works was 7230; and the consumption of gas for public lighting about 91,600,000 cubic feet. The consumption of coals was 89,343 tons; and the production of coke, 552,400 barrels. The capital invested in these gas-works amounted to £683,000 at the end of last year. The net profits were about £51,800, or nearly 7·7 per cent. on the capital at which the works are estimated. The profits are, however, in reality greater, as many towns do not credit the works with the cost of public lighting. The use of gas for cooking, heating, and power is continually increasing.

The Board of Trade and Steam-Pipes.—The Board of Trade have instructed their Surveyors that all new steam-pipes are to be tested by hydraulic pressure to not less than twice, and not more than two-and-a-half times the working pressure, unless the case has been specially submitted to the Board for consideration. As regards old steam-pipes, for a period of six months from the date of the instruction the Surveyors may exercise their discretion as to the test-pressure they apply—taking care that such test does not exceed twice the working pressure, and that when it is less than twice the working pressure, the declarations granted are limited to a period not exceeding six months. If in any case the Surveyors cannot get such a test pressure applied to old pipes as they consider necessary, they are to forward full particulars of the case to the Board, in order that the necessary directions may be given. After six months from the date of the instruction old steam-pipes are to be tested to a pressure of at least double the working pressure; but double the working pressure is not to be exceeded unless the case has been referred for consideration. The Surveyors may test steam-pipes at any time they consider necessary; but, except in special cases, possibly once in about three or four years may be found sufficient. When steam-pipes are tested, the lagging or covering is to be off the pipes, and the pipes are to be carefully examined before, during, and after the hydraulic test. The Surveyors are to see that efficient means are provided for the draining of all the steam-pipes.

THE SOUTH-EASTERN COAL-FIELD.

At the recent Meeting of the British Association at Cardiff, Professor Boyd Dawkins, F.R.S., made the following communication on the above subject to the Geological Section :—

The beginning of the enterprise which has resulted in the discovery of coal measures at Shakespeare Cliff, near Dover, was laid before the British Association at their meeting in Manchester, in 1887, and the bare facts have been from time to time published in the Press. The full account cannot obviously be written till the exploration is completed. It is, however, not unfitting that the results up to date should be laid before the Section in this great centre of coal industry—not merely on account of their important bearing on the economic future of South-Eastern England, but because also the great coal-field of South Wales is the western representative of the series of coal-fields now proved to extend eastwards from Somersetshire to join those of Northern France and Belgium.

The physical identity of the south-western coal-fields with those of Northern France and Belgium was recognized by Buckland and Conybeare as far back as 1826, as well as the fact that the Somersetshire coal-fields lie partly concealed by the secondary strata. It was not, however, till 29 years later—viz., in 1855—that the possibility of the extension of the coal measures beneath South-Eastern England was advanced by Mr. Godwin-Austen. Two years later the possibility had grown in his mind into a probability. He further concluded that they exist at a workable depth; and he indicated the Thames Valley and the Weald of Kent and Sussex as places where they might be sought for. These conclusions gradually made their way; and in the next 11 years they became part of the general body of geological theory.

The question was next taken up by the Coal Commission in 1866, in which Mr. Godwin-Austen's views were fortified by the support of Professor Prestwich. The publication of this report in 1871 contributed largely to the solution of the question, by helping it onwards towards the experimental stage. In the following year, the Subwealden Exploration Committee was organized by Mr. Willett, to test (by boring) the existence of the carboniferous and other rocks in South-Eastern England. The site chosen was Netherfield, near Battle, in Sussex; and the bore-hole, after being carried to a depth of 1904 feet from the surface, had to be abandoned. The net result of this experiment was to prove that the oolite rocks were more than 1700 feet thick in that region; while we knew that the Wealden strata above them were more than 1000 feet thick. It was obvious, therefore, that the next attempt to solve the problem should be made farther to the north, along the line of the North Downs, where Mr. Godwin-Austen believed the Wealden strata abruptly terminated against the coal measures and older rocks.

I come now to the last experiment, which has solved the problem. In 1886 I presented a report to Sir Edward W. Watkin, Chairman of the South-Eastern Railway and the Channel Tunnel Company, on the general question, and recommended, on both scientific and commercial grounds, that a boring should be made in South-East Kent, in the neighbourhood of Dover, and that the Channel Tunnel works offered the best site for a trial. It was almost within sight of Calais, where the coal measures had been proved at a depth of 1104 feet. It was also not more than six miles to the south of a spot where about 4 cwt. of bituminous material was found embedded in the chalk, in the course of making a tunnel, which, according to Godwin-Austen, had been derived from the coal measures below. Prestwich also had pointed out in 1873, in dealing with the question of a tunnel between England and France, that the older rocks were within such easy reach at Dover that they could be utilized for the making of a submarine tunnel. Mr. Whitaker likewise pointed out in 1886 that Dover would be a good site for a tunnel. Unfortunately, my attention was not drawn to this till 1890.

Sir E. Watkin acted with his usual energy on the lines of my report; and the work was begun in 1886, and has been carried on down to the present time under my advice. The boring operations have been under the direction of Mr. F. Brady, the Chief Engineer of the South-Eastern Railway Company, to whose ability we owe the completion of the work to its present point, under very difficult circumstances. A shaft was sunk on the west side of Shakespeare's Cliff, close to the shaft of the Channel Tunnel, to a depth of 44 feet to high-water mark; and from the bottom of this a bore-hole has been made to a depth of 1500 feet. This section is as follows: Cretaceous, 500 feet; oolites, 613 feet; coal measures, 387 feet. The oolites were struck at about 500 feet below high-water mark; the coal measures at 1113 feet; and the first seam of coal at 1140 feet. Below, five other seams occur, at various intervals, down to 1500 feet, giving, according to Mr. Brady, a total thickness of workable coal of not less than 10 feet—the thicker seams being about 2 ft. 6 in. The coal measures are inclined at a gentle angle of 1 in 28.

It may be remarked that the coal measures at Dover occur at a point below high-water mark, which is within 9 feet of where they were struck in 1850 in a boring at Calais, or at a depth of 1104 feet. From this it may be concluded that the plateau of coal measures and older rocks lies buried beneath the newer strata to the west and north of Dover at about this depth, and that it forms part of the plateau which has repeatedly been struck in the London area at about the same depth. This discovery proves up to the hilt the truth of Mr. Godwin-Austen's views as to the range of the coal measures along the line of the North Downs; and it also proves the existence of a coal-field in South-Eastern England at a depth well within the limits at which mining can be carried on at a profit. The British coal-fields are worked to depths ranging to 3000 feet, and those of Belgium to depths of between 3000 and 4000 feet. Year by year as the means of ventilation, and especially by the use of compressed air, are improved, the workings are being pushed to greater depth. The south-eastern coal-field probably forms part of the same trough as the Calais measures prolonged westward under the Straits of Dover. It is one of a chain of coal-fields which will, in my opinion, ultimately be proved to occur between Dover and Somersetshire, along the line of the North Downs, in long, narrow, east and west troughs.

It remains now to consider the value of the discovery of the south-eastern coal-field. The coal is good, bright, and blazing with cleat slightly lozenge shaped, and with marks of crushing in two out of the six seams. The small amount of crushing presented by the samples is an important fact, in marked contrast with the pulverized condition of some of the coals—the Boulonnais. When the many coal seams in the French, Belgian, and Westphalian fields are taken into account, the discovery of more seams at Dover is, in my opinion, merely a question of sinking deeper. I should also expect to meet with thicker seams, as in the Department of the Nord, where they run to a thickness of 4 feet. There can be but little doubt as to the value of the south-eastern field when we consider the amount of coal in the above-mentioned fields, with which it was once continuous. On the east, the Westphalian field is 7213 feet thick, with 117 seams, yielding 294 feet of workable coal. That of Liége is 7600 feet, with 85 seams and 212 feet of workable coal. That of Mons is 9400 feet, with 110 seams and 250 feet of workable coal. On the west, in Somerset, the coal measures are 8400 feet thick, with 55 seams, yielding 98 feet thick of workable coal. The south-eastern field is to be classed with these; and it probably contains similar quantities of coal.

The experiment which has been so successfully carried out by Sir E. Watkin is likely to be followed by far-reaching consequences. It is not improbable that the south-eastern coal-field will be worked in the immediate future, and that centres of industry, similar to Liége and Cardiff will spring up, in the course of time, in the secluded region of Kent. The iron-fields of the Wealden area were largely worked down in the days of Elizabeth, until the fuel necessary for smelting the ore was almost exhausted, and the iron-masters were compelled to transplant their industry elsewhere, and more especially to North Wales. It would be a singular and not impossible revolution of the wheel of time if again the lost industry should be restored to South-Eastern England through the discovery of the coal measures which lie buried under the North Downs. Whether, however, this happens or not, the discovery of the south-eastern coal-field will lead to the discovery of other fields which are concealed by the newer rocks in England, and will postpone the evil day when our coal will become exhausted, and when the industries depending upon it will depart to new regions. It is likely to upset all calculations of the duration of our coal-fields which have excited so much attention at this meeting.

Samuel Hunter.—A Manchester contemporary of last Friday's date contained the following paragraph: "It is said that the convict, Samuel Hunter, will be released from prison shortly before Christmas next. It will be remembered that Hunter was, on the 6th of July, 1888, sentenced by Mr. Justice Hawkins at the Central Criminal Court, London, to five years' penal servitude for perjury, and to one year's imprisonment upon other charges of fraud—the sentences to run concurrently, and to date from March, 1888, when Hunter was committed for trial. It is believed that there will be a deduction of about three months from each year's confinement on account of the good conduct of the prisoner. It may be stated that Hunter, who was formerly at Strangeways gaol was transferred from there to Stafford, and thence to Portsmouth or some other public works prison. The prison authorities in Manchester have therefore no knowledge of what may be done with the convict."

Water-Works in Honduras.—The works which will in future supply the city of Tegucigalpa with water have lately been completed. They consist of eight miles of pipe 12 inches in diameter at the stream whence the water is taken, which is about 1750 feet above the city level. The pipe reduces to 7 inches in diameter at the distributing reservoirs, the first of which is on a hill 900 feet high, and the second 740 feet below the first; the distance between the two being 4000 feet. The quantity of water passing through the pipe is about 125 cubic feet per minute; and it is proposed to use the 140-horse power developed by the water in passing from one reservoir to the other to light the city by electricity. The construction of these water-works involved numerous difficulties. All the pipes, tools, and labour had to be imported from the United States, and carried from the coast over 93 miles of rough mountain road. The whole work was completed within twelve months after the time the ground was first broken.

REGISTER OF PATENTS.

Utilizing Waste Gases in Regenerative Gas-Furnaces.—Siemens, Frederick, of Queen Anne's Gate, Westminster. No. 16,207; Oct. 11, 1890. [11d.]

In patent No. 15,127 of 1884 were described means of utilizing waste gaseous products of combustion in regenerative gas-furnaces, by causing a portion of those gases, after doing work in the furnace, to pass through hot fuel, so that the carbonic anhydride of the gases might become converted into carbonic oxide, fit for being burned again. Also in patents Nos. 4644 and 20,083 of 1889 were described constructions of furnaces having air-regenerators only, and having gas-producers placed near the furnace chambers and supplied in part with waste gases from the furnace chambers, or with heated air from the regenerators. The present invention applies to regenerative gas-furnaces provided with air-regenerators alone, or with gas as well as air regenerators—these being in both cases either reversible or continuous. In the former case, the gaseous products of combustion from the furnace that are to be introduced into the gas-producers, may be taken from the chimney-flue, or from the upper part of the air-regenerators, or from any place between these points. In the latter case, those that are to be introduced into the gas-producers may be taken from the chimney-flue, or from either or both the gas and air regenerators, or from any point between the furnace chamber and the chimney-flue. The gas-producers of the furnaces are placed near them, and are supplied by the action of steam, air, or other injector jets, with the gaseous products of combustion above referred to; the passages to the producers being so arranged in relation to the flues and reversing-valves, when such valves are employed, that gas or air leaking past them are carried into the producers. The waste gases from the furnaces introduced into the gas-producers may be mixed with air at their entrance into them; or air, heated or not, may be passed into the gas-producers by separate jets or blowers.

Fig. 2 is a longitudinal section showing an arrangement of furnace having the air-regenerators B^1 below, as in fig. 1 of the drawings in patent No. 4644 of 1889, but having a pair of alternating gas-regenerators (of which one B is illustrated) interposed between the producer C and the furnace chamber A. Each of these gas-regenerators consists of two compartments B, separated (except at the lower part) by a partition X, causing the gases to descend the one and ascend the other; but this arrangement may be varied by constructing gas-regenerators without such partition-walls, as X. The gas-regenerators are connected to the chimney-flue, by flues governed by valves R; to the top of the producer C, by flues governed by valves V; and to the ash-pit of the gas-producer, by passages H provided with jets K and valves U. It will be understood that a portion of the gas which may leak through the valve V will be carried into the gas-producer, with the products of combustion, by the action of the jets K.

Fig. 3 is a part longitudinal section, fig. 4 a sectional plan, and fig. 5 a transverse section of a furnace with continuously acting air-regenerators, arranged on each side of a central producer C. The products of combustion from the furnace chamber A—which in this case is shown as applied for heating gas-retorts R—pass along the zigzag flues P P_2 P_3 P_4 towards the chimney-flue G; while the air supply becomes heated by passing along the adjacent zigzag flues W W^1 W_2 W_3, and is delivered by suitable openings into the combustion flues D^1, where it enters into combustion with gas issuing from the gas-producer C through the ports D. From the lower flues P_4 on each side, passages H lead into the producer C; these passages being provided with jets K. The air-regenerator is shown divided into two parts; but it will be understood that in many cases it may be preferable to employ one air-regenerator as in figs. 4 and 5 of patent No. 20,083 of 1889, or that air-regenerators of the reversible type may be employed, as in figs. 1 and 2 of this patent, in figs. 1 and 2 of patent No. 20,083 of 1889, and again in figs. 1, 3, 6, 8, 9, 11, 13, and 14 of patent No. 4644 of 1889.

In figs. 3, 4, and 5 the products of combustion are shown as delivered into the gas-producer through two openings from the bottom of

Fig. 1.

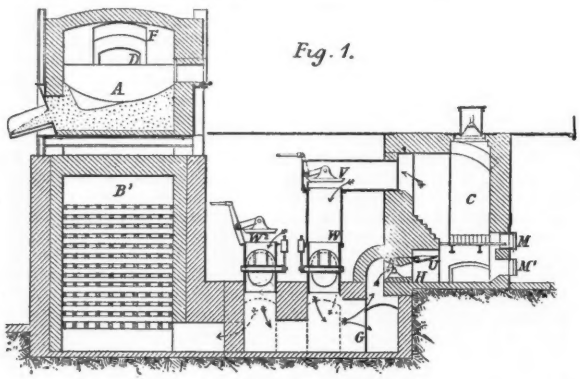


Fig. 2.

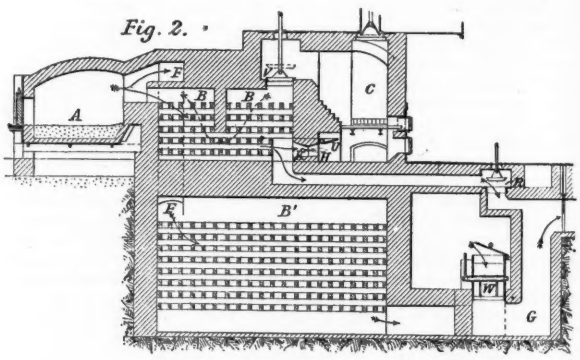


Fig. 4

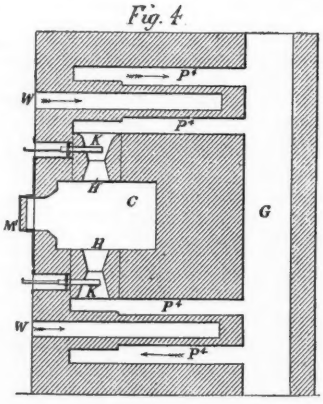


Fig. 3.

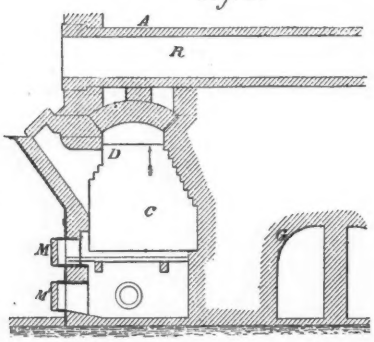


Fig. 5.

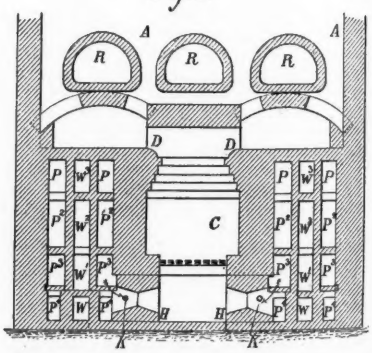


Fig. 1 is a vertical section of a regenerative gas-furnace with gas-producer arranged according to this invention.

A is the furnace chamber, which may be of considerable length, extending over the gas-regenerators B and the air-regenerators B^1, through a pair of which the hot products of combustion pass from the furnace on their way to the chimney-flue G, while the air and gas pass through the other pair on their way to the furnace. The action of the two pairs of regenerators is alternated in the usual way by means of reversing-valves W and W_2. The air and gas enter the furnace chamber by ports F D, at its one end; the products of combustion issuing by corresponding ports at its other end. C is the producer, provided with poking and ash doors M M^1, and with a steam, compressed air, or oxygen jet J for introducing more or less air to the ash-pit as may be required to maintain the necessary heat. In connection with the passage to the chimney-flue (which is governed by the damper N), is formed a passage H into the ash-pit of the producer; and in this is arranged a jet K of steam, air, or oxygen, by the action of which some of the products of combustion are drawn from the flue G and driven into the producer, together with such gas and air as may be mixed with them owing to leakage through the reversing-valves W W_2, or otherwise. The supply to the jet K may be shut off; and, the passages H being closed by the valve U, the producer can be worked without being supplied with products of combustion, either by means of the jet J or by removing the doors M M^1.

the air-regenerator; in fig. 1 they are shown as delivered into the gas-producer from one opening near the chimney-flue, though they may be introduced into the producer from the top part of the gas and air regenerators; and in fig. 2 they are shown as delivered into the gas-producer from the bottom of the gas-regenerator. But it will be understood that when air-regenerators alone are used, the products of combustion may be taken from any other place between the top of the regenerator and the chimney-flue; and that, when gas and air regenerators are employed, the products of combustion may be taken from any point between the furnace chamber and the chimney-flue. In both cases they may be delivered into the gas-producers through any number of openings, as may be required, whether reversible or continuously-acting regenerators are used.

The furnace and gas-producer may have reversible air-regenerators arranged so that the flame enters the heating chamber continuously from two flame ports; the products of combustion passing away continuously through one opening. The air issuing from one of the regenerators, flows to the two ports, where it meets with gas from the producer; and the products of combustion pass to a cross flue, and are partly directed under the gas-producer and partly through one of the regenerators, and the reversing-valve to the chimney.

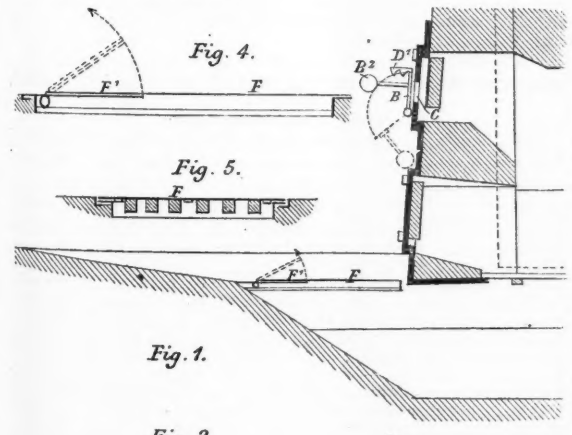
There is still another form of producer which may be used in furnaces constructed for regenerating the products of combustion. In this construction, the fuel is charged through a vertical retort projecting

into the producer chamber in which the fuel is distilled; the issuing gases passing to a chamber, whence they are injected with the products of combustion coming from the furnace through a flue into the gas-producer by means of an injector. These distilled gases, by mixture with the highly-heated products of combustion, will be transformed into permanent gases of light specific gravity; and this action will be promoted by their passage through the incandescent fuel, in company with the other gases to be converted, whence all the gases pass away through the flue to the furnace chamber. By admitting air or oxygen through the flue, the combustible gases may be ignited below the producer grate, and thus help to maintain the heat of the incandescent fuel; or they may be ignited in the chamber by means of air or oxygen introduced for the purpose, and mixed in the burnt condition with the products of combustion coming from the furnace by the flue, and be drawn into the gas-producer by the injector.

In patent No. 972 of 1863, granted to the late Sir William Siemens and the present inventor conjointly, means were described whereby the hydrocarbon gases liberated from fuel under decomposition in vertical gas-producers supplied with air by steam injectors could be withdrawn at the top of the chamber, to be dealt with separately from the other gases produced, or to be mixed with them; or these gases could be passed through the incandescent fuel in the lower part of the apparatus, in order to decompose the heavy hydrocarbon gases and vapour evolved. Also in patents Nos. 3018 of 1864, 1513 of 1870, 3374 of 1880, 3792 of 1881, and 663 of 1883, obtained by Sir W. Siemens alone, various means were shown whereby hydrocarbon gases liberated from fuel under decomposition in gas-producers could be passed through incandescent fuel in the same producers, for the purpose of converting them into permanent gases, so as to avoid any deposit of tar in the flues. Again, in patent No. 9103 of 1884, several forms of gas producers were described, with means for dealing separately with the hydrocarbon gases evolved from the upper part of the fuel under decomposition, or of mixing them with the other gases produced—in both cases after the hydrocarbons had been intensely heated by passage through heated channels, or by being brought into contact with incandescent fuel for the purpose of converting tarry constituents into permanent gases. All these patents relate to the conversion of heavy hydrocarbons into permanent gases by passing them, without admixture, through, or in contact with, incandescent fuel in gas-producers, or through channels heated by incandescent fuel; whereas the present arrangement involves the introduction into gas-producers of the hydrocarbons mixed with hot products of combustion, which hydrocarbons may be ignited and burnt below the grate of the producer, or may be burnt in a separate chamber previous to their introduction into the gas-producer.

Retort-Furnaces.—Zubr, J., of Vienna. No. 9354; June 2, 1891. [8d.]

This invention in retort-furnaces has for its object to regulate the admission of air needed for the purpose of combustion, whether circulating during the initial or subsequent stages of the operation. According as it is required for consumption during the various stages of the heating process, the admission of air must be regulated—that is to say, either increased or decreased—and this is effected by forming in the upper furnace-door an opening, closed by a valve which is opened automatically with the door, and by further providing a gridiron valve to regulate the air used during the first stage of the process. A throttle valve is moreover arranged in the chimney, which is completely closed when the fire is being lighted.



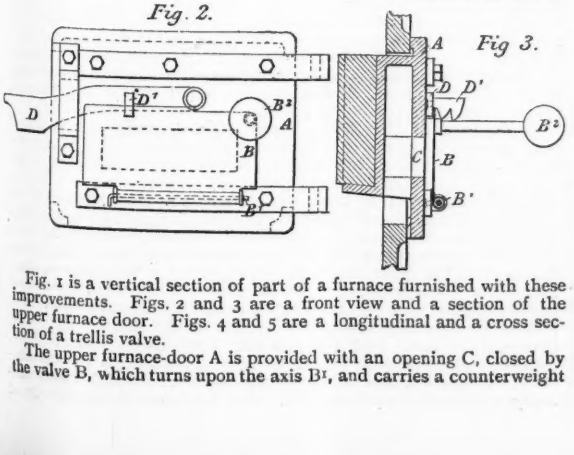


Fig. 1 is a vertical section of part of a furnace furnished with these improvements. Figs. 2 and 3 are a front view and a section of the upper furnace door. Figs. 4 and 5 are a longitudinal and a cross section of a trellis valve.

The upper furnace-door A is provided with an opening C, closed by the valve B, which turns upon the axis B^1, and carries a counterweight at the top. This counterweight B^2 has a tendency to open the valve, which is held by a toothed projection D^1 fixed to the lever D of the furnace-door. On the door being opened, the valve B^1 is likewise automatically opened by its counterweight; and it then remains open until after the door is closed. In this way the air may have direct access to the products of combustion accumulating on the top of the coke. As it is after the first and subsequent firings that the greatest evolution of carbonic oxide takes place, a greater volume of air is required at such times; this air being admitted in sufficient quantity through the opening in the door. In the course of the heating process carried out according to this invention, less carbonic oxide gas being generated than heretofore, a proportionately less quantity of air will be required. The counterweight will, therefore, be made to bring the valve upon the first tooth, and to subsequently close it hermetically upon the second tooth of the projection D^1. The time at which these various manipulations should be undertaken has been determined by experiment, the results of which are given by the inventor in the following tabular statement:—

Regulation Table.

Air used in the After-Stages of the Process with the Upper Furnace-Door Valve.			Air used in the After-Stages of the Process with the Trellis Valve.	
O'Clk.				O'Clk.
7	Preparing fire with .	100 kilos of coke	Valve fully open	7
7.45	Valve on first tooth.	—	„ „ closed	7.45
9	Stirring and addition of	75 kilos of coke	„ „ open	9
9.45	Valve on first tooth.	—	—	—
10	„ entirely closed	—	Valve fully closed	10
11	Stirring and adding.	75 kilos of coke	„ „ open	11
11.45	Valve on first tooth.	—	—	—
12	„ closed . . .	—	—	—
1	Breaking up, stirring, and adding. . .	75 kilos of coke	—	—
1.45	Valve on first tooth.	—	—	—
2	„ entirely closed.	—	Valve fully closed	2
3	Stirring and adding.	50 kilos of coke	„ „ open	3
3.45	Valve entirely closed	—	—	3.45
4.30	Stirring and adding.	50 kilos of coke	—	—
5	Valve completely closed	—	—	—
7	See above. . . .	—	See above . .	7
12 hrs.	Consumption . .	425 kilos of coke	. . . . .	12 hrs.

This manipulation is very simple, the patentee remarks; the closing of the valve taking place when the retorts are fed. The regulating of the air consumed during the initial stage of the process is effected by a pivoted gridiron valve F^1 arranged in the flooring F, and can be seen in the above table. With coke from slag coal, the valve may be opened a little more than above stated. Care must be taken that the height of the layer of coke should not extend beyond the lower edge of the upper furnace-door. Every retort-furnace may be easily treated in the manner set forth. Besides the above-mentioned reconstruction, a throttle-valve is arranged in the chimney, and has for its object to entirely close the latter when the fire is being made up, whereby the escape of heat is prevented, and a uniform temperature obtained. The throttle-valve is drawn by means of a wire, which exerts a pull on a lever, so that the valve entirely closes the opening in the chimney. When the wire is released, the valve is raised automatically by means of a counterweight with which it is furnished. This throttle-valve, however (being of known construction), forms no characteristic feature of the invention.

APPLICATIONS FOR LETTERS PATENT.

14,661.—Clayton, S., "Improvements in governing mechanism for gas-engines." Aug. 31.

14,674.—Pope, R., and Hender, F., "Asbestos packed water gauges, cocks, and valves." Aug. 31.

14,735.—Devonshire, E., "Improvements in apparatus for purifying or treating water." Sept. 1.

14,787.—Lake, H. H., "Improvements in liquid-meters." A communication from the Rogers Liquid Meter Company. Sept. 1.

14,814.—Chiswell, F. C., "An improved burner for gas-fires." Sept. 2.

14,880.—Davidson, J., "A self-closing valve for water or other liquids under pressure." Sept. 3.

14,896.—Weyman, J. E., and Drake, J. A., "Improvements in apparatus and appliances for starting gas-engines, oil-engines, and the like motors." Sept. 3.

14,941.—Hamilton, J. H., "Improvements in combustible gas or vapour engines." Sept. 4.

14,961.—Harrison, T. B., and Hudson, G. W. S., "Improvements in and relating to non-regenerative gas-lamps." Sept. 4.

15,054.—Clarke, A. H., "Improvements in wet gas-meters." A communication from G. W. Gay. Sept. 5.

Seville Water-Works Company, Limited.—The Directors of this Company have given notice that the interest on the 6 per cent. debentures will be reduced to 5 per cent. after Dec. 31 next. Debenture holders must send notice to the Secretary by the 29th inst. should they wish for renewals.

Extension of the Constant Supply Service in the Lambeth Water Company's District.—The Lambeth Water Company have given notice to the London County Council that, in conformity with the provisions of the Metropolis Water Act of 1871, they propose to give on and after April 1, 1892, a constant supply of water to a part (which they specify) of the parish of St. Giles, Camberwell; on and after Oct. 1, 1892, to the hamlet of Penge; and on and after April 1, 1893, to parts of the parishes of Holy Trinity, Clapham, St. Mary, Lambeth, and St. Leonard, Streatham.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Smoke Nuisance.

SIR,—With the advent of autumn, our thoughts naturally revert to the question of fog and smoke, which for at any rate some six months of the year is to Londoners of paramount importance. Much has been said and written of late on the subject; but we seem as far as ever from a removal of the difficulty, and we shall probably this winter have to suffer a repetition of the miseries we have so often and so long endured. Experience teaches that the principal offender is not the large factory but the domestic hearth; and it is in some variation of the present usual mode of warming our dwellings and cooking our food that the remedy is to be found.

It is perfectly clear that, if the ordinary fuel be used, smoke is the result; and it is equally clear that this means black fog, with its attendant evils. Why then, do people persist in burning that which is certain to prove so deleterious, when they have at hand a fuel at once cleanly and easily managed, cheap, and with efficient ventilation (which can be readily arranged) innoxious? The answer is only to be found, I suppose, in that ignorance or prejudice which often for a length of time prevents the use of a remedy pressed upon the public attention.

There can be no doubt whatever that, by the general and consistent use of gas as a fuel instead of coal, London can be relieved of three parts of the poison which fills its winter atmosphere; and those who devote their energies to impressing this fact upon the community, deserve the grateful thanks of their species.

A great deal has been done in the way of lectures, pamphlets, &c., under the auspices of gas companies; but it is to be feared that these efforts, excellent in their way, are sadly hampered by the fact that they are regarded with suspicion by the public. What is wanted is that the general press should take the matter up, and compel householders to see that it is not simply for the sake of the suppliers of gas and gas-stoves, but in the public interest, that this common-sense remedy is advocated. If also, instead of experimenting with various forms of smoke-consuming appliances, &c., the Societies formed for the purpose of studying the question of smoke abatement would turn their attention to increasing the sale and use of gas as a fuel, they would deserve well of their generation, which they can hardly be said to do at present.

A practical solution of the problem lies at his door; but the intelligent Londoner who uses coal for fuel will not accept it—doubtless, in many cases, because he regards it as simply a ruse on the part of the gas companies to increase their business. Well, he must endure the fog until he comes to his senses; but it is a duty to point out that his sufferings are in a great measure avoidable and unnecessary.

Buckhurst Hill, Sept. 9, 1891. H. REGINALD SIBSON.

The Coal Resources of England.

SIR,—In this week's JOURNAL, there are some valuable observations on Mr. Forster Brown's paper upon our coal resources; and the writer suggests the creation of a "National insurance fund, by putting a tax of 6d. or 1s. per ton upon all coal to be raised henceforth in the kingdom."

Surely my plan of imposing a duty of 5s. per ton on all coal exported, as proposed in the JOURNAL for July 22, 1890, is preferable; inasmuch as it would considerably diminish the export, and thus leave a larger reserve for home consumption. A duty upon all coal raised would affect all classes of the community, and would be unpopular. An export duty would be disliked almost exclusively by coal-owners, coal miners, and shippers. It would, however, benefit the public generally; inasmuch as the restricted demand would tend to lower the price of coal.

It is unlikely that a duty of any kind will be imposed unless authorized by public opinion; but should the present high prices be only slightly relaxed, and afterwards increased (as I fear is not unlikely), the public may wake up to the policy of reserving coal for home consumption.

Sept. 10, 1891. A GAS DIRECTOR.

The Yeadon Water Company and the Local Board.—A proposal having been made that the Yeadon Local Board should purchase the property of the Water-Works Company, the Secretary of the latter body (Mr. J. W. Harrison) addressed a letter to the Board, to the effect that his Directors are not prepared to enter into any negotiations for the sale of their plant. When this letter was read at a recent meeting of the Board, some of the members expressed the opinion that this reply from the Company was definite enough; and Mr. Waterworth reported that, at a Committee meeting held for the purpose of deciding the lines on which a deputation from the Board should approach the Company, it was resolved not to entertain the question any further.

Gas Companies and the Price of Coal.—The *Liverpool Journal of Commerce*, dealing with the above subject in a recent issue, said: "The coming winter is apparently going to be a more hopeful one for the gas companies of the kingdom than was its predecessor. Last year famine prices in most classes of coal were witnessed; and the price of gas kinds especially was so high that the profits of gas manufacturing concerns were adversely affected. Allusion to the cause was made in many reports; and in more than two or three instances, the price of gas was raised to the consumers. Within the past week or two, heavy contracts for gas coals have been given out for both Metropolitan and Provincial companies; and the terms accepted by the coal-owners for good kinds have been from 8s. 6d. to 9s. per ton for large quantities delivered over the season. This is from 1s. 6d. to 2s. per ton less than was paid for the same classes last year; and gas shareholders generally—and gas consumers in some cases—may anticipate a relief from the conditions that pressed so severely upon some of them las season."

MISCELLANEOUS NEWS.

THE RECENT EXTINCTION OF GAS IN THE SULTAN'S PALACE AT CONSTANTINOPLE.

Flooding of the Imperial Ottoman Gas-Works.

In the JOURNAL last week, reference was made to the accidental extinction of the gas in the Sultan's palace in Constantinople, and to the change of Ministry which ensued thereon, owing to his Majesty's suspicion that this most unusual occurrence was part of some political intrigue. It really, however—although this fact could not be impressed upon him—was the result of the flooding of the gas-works and mains during a storm of probably unexampled severity. That the palace should have escaped unscathed is scarcely to be expected, when the extent of the havoc caused by the storm, as revealed in the following details kindly supplied to us by a correspondent on the spot, is taken into consideration. Our correspondent says:—

On Saturday, the 29th of August, Constantinople was visited with one of those severe rainstorms which are so common in hot climates, and which frequently cause an immense amount of damage. As a consequence, a very serious accident occurred at the Imperial Ottoman Gas-Works at Dolma Baghtche. These works are situated at the extreme end of a deep valley close to the Bosphorus. This valley drains a large portion of the upper part of the city, including Pera and Chichle, and is naturally an outlet for the surface water. About three o'clock in the afternoon of the above-named day, when the storm was at its height, the water rose in the valley, and burst the retaining wall at the end of the gas-works—pouring through the broken wall in one irresistible mass, and completely flooding them. The fires in No. 1 retort-house, which contains 112 retorts, were nearly all extinguished; but as the second house stands on higher ground, it escaped with little damage. Immediately adjoining the retaining wall are situated four gasholders; and, at the time of the accident, these were full. One of them (a small holder of 20,000 cubic feet capacity) was lifted by the water above the tank; and one of the guide columns breaking, it tilted over. A guide-pulley broke on another of the holders, of about 60,000 cubic feet capacity; and the holder tilted against the columns. But, owing to the presence of mind and promptitude displayed by the Engineer (Mr. W. S. M'Gregor), the gas was withdrawn, and the holder then slowly settled into its tank without sustaining further damage. At this time the water was more than 3 feet deep in the works; and all the pipes there, as well as in the low-lying portions of the city, were completely filled. The Engineer having requested further assistance, squads of soldiers were sent; and, under the direction of Colonel Vinicombe Bey, Member of the Imperial Council of Tophane, a large trench was dug, and at about seven o'clock the works were practically free from water. In the meanwhile, men were dispatched outside, to get the mains clear; and the lighting of the city was resumed as usual, with the exception of a small part of Galata where the streets were impassable. The Engineer organized gangs of men, and the fallen holder was lifted; and, being temporarily repaired, by Sunday night it was again at work. The other holder, it was found, would take some days for repair, as an immense quantity of sand and *débris* had been washed into the tank. Fortunately no loss of life occurred, although several of the officials had narrow escapes. According to the local newspapers, no such storm had been known for nearly fifty years. Bodies were actually washed out of the graves in several of the cemeteries and carried down into the streets.

THE ABANDONMENT OF ELECTRIC LIGHTING AT BARNET.

From a Local Correspondent.

Since Tuesday, the 1st inst., the streets of Barnet have been lighted by means of gas-lamps; the Local Authority having, after three years' trial of the electric light, decided, as readers of the JOURNAL are aware, to revert to the old illuminant, and signed a contract for a similar period with the Barnet District Gas and Water Company for the public lighting. The change has long been looked for by the residents; and, now that it has actually been brought about, it is regarded with the liveliest satisfaction, even by many who were among the most ardent supporters of, and enthusiastic believers in, the "new light." To use a hackneyed phrase, the electric light is undoubtedly likely to become the "light of the future." But, as has been frequently pointed out, we live in the present; and the people of Barnet have found, by actual experience, that—for the present, at all events—the new illuminant cannot successfully compete with gas, and, be it remembered, gas sold at 4s. per 1000 cubic feet. Of course, it would be idle to assert that electric lighting is impracticable; for there are evidences that it can be made successful, and that, where cost is not an important factor in the calculation, it is in demand. There are instances, too, in which convenience may be properly and even advantageously considered before or entirely apart from cost. But it is none the less clear that, having due regard to expenditure, electric lighting of the streets of provincial towns is out of the question at present.

In the case of the Barnet installation, incandescent lamps of nominally 32-candle power were used; and their number was practically equal to that of the nominal 15-candle power gas-lamps in the pre-existing system of lighting. But as the former were nearly double the price per lamp of the latter, the net result of the adoption of the electric light was a serious increase in expenditure. This might, perhaps, have been tolerated had the Local Authority been satisfied that their district was better lighted than before. This was evidently not the case; and an expert whom they engaged to test the lights reported that, while a few lamps were above the nominal power, the greater number of them were far below—a few being little more than 12-candle power, or from 2 to 3 candles less than the old gas-lamps at little more than half the cost. Nor was this all. The lighting was irregular; many of the lamps were out night after night, and on several occasions, the entire system failed, and the whole of the lights were suddenly extinguished—plunging the town into total darkness. On at

least one occasion, this occurred while the Saturday evening shopping was in full swing; and in one instance, the inconvenience caused was so great that the Clerk to the Local Board found it necessary to make temporary arrangements with publicans, shopkeepers, and private residents, to show gas and other lights in their windows, and, where practicable, outside their respective premises. Added to this, Major Cardew, the Electric Lighting Adviser of the Board of Trade, more than once made strong complaints concerning the character of the installation, and threatened to order the discontinuance of the lighting, failing prompt remedy of the alleged grounds of complaint. Towards the close of the term of contract, the Local Board had an idea that a system of arc lamps might be more successful than the less powerful lights; and a 2000-candle lamp was accordingly temporarily fixed at the junction of High Street and Wood Street, at the entrance to the town. This also was most erratic in its behaviour, and occasionally went out altogether. Under these circumstances, the Board at length determined, to the evident satisfaction of the great bulk of their constituents, to allow the contract to expire. True, they clung to the hope that they might still have the electric light; but, after vainly advertising for tenders (vainly in the sense that they could not get any quotation which compared favourably with the cost of gas), they decided to approach the Gas Company, and did so with the result already stated.

The new system of lighting is giving much satisfaction. Throughout the High Street and Wood Street, double burners are used; and with lamps of the latest pattern, fitted with reflectors, very good effects are obtained. At the street junctions, triple-burner Sugg lamps are used, and are found to be very effective; while in the less important thoroughfares single-burner lamps are placed. A few of the remaining friends of electricity have been endeavouring to show that increased expenditure has resulted from the change. They conveniently forget, however, that many additional lamps are in use, and that some streets (mostly recently formed and built upon) that formerly were entirely unilluminated are now excellently lighted. In fact, it is incontrovertible that, light for light, gas is far cheaper than the system it supersedes, besides being a great deal safer and incomparably more reliable. The contractor for the recent electric lighting considers himself badly treated by the Local Board; and he has given notice of his intention to go to law with them over a claim of some thousands of pounds. Without attempting to express an opinion as to the merits of this claim, those who know anything of the cost of lawsuits, even to the successful litigant, will have little difficulty in arriving at the conclusion that Barnet will by-and-bye have even less cause to love the "light of the future," so far as their own experience goes.

But what was the effect of the change from gas to electricity as regarded the Gas Company? Those who read the report of the Company's half-yearly meeting, published in the JOURNAL for the 1st inst. (p. 407), will remember that the gas revenue has gone on increasing; so that the change has evidently done little, if any harm. Nay, it is more likely to have done good; for the Company, recognizing the fact that, if their public lighting was to be curtailed, some other source of revenue must be sought, promoted a series of lectures on cooking and heating by means of gas, and held exhibitions of gas cooking and heating appliances. This undoubtedly increased their sales of gas; and they now have the restored lighting in addition.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

Annual Report and Accounts.

At the Meeting of the Carlisle Town Council last Tuesday—the MAYOR (Alderman B. Scott, J.P.) in the chair—the reports and accounts of the Gas, Water, and Baths Committee for the year ending June 30 were presented.

In the portion of the report dealing with the Gas Department, the Committee stated that the accounts continued to indicate an increase in the consumption of gas, arising from the gradual extension of the city, and largely from the great number of gas cookers, fires, and other appliances now in use. The revenue for the past year was, of course, adversely affected by the further rise in the price of coal, and especially of cannel. The advance is shown by the following figures: In 1890 the cost of coal and cannel was £11,095; in 1891 it was £16,188—being an increase of £5093, or 45·93 per cent. Every care was exercised by the Committee to lessen the effect of this abnormal rise; but, after taking into account the higher return from residual products, the result is that the cost of gas in the past twelve months, as compared with the year 1889-90, was £3675 more, or equal to 4·38d. per 1000 cubic feet. The profit upon the year's working was £3560, as against £6307 in the preceding period. It is satisfactory to find that the contracts for coal for the current year have been made at somewhat lower prices than those for 1890-91. With reference to the Water Department, the Committee reported a continued increase in revenue; and the profit was £4749, as compared with £4524 in 1889-90. The gross profits from the gas and water undertakings for the year ended June 30 last were together £8309.

The Gas and Water Engineer (Mr. J. Hepworth, M. Inst. C.E.) reported that the works had been maintained in a thorough state of repair and efficiency, and were at the close of the financial year in a very satisfactory condition. The alterations completed during the past twelve months included purifiers and purifier-house, chemical laboratories, and workmen's rooms. Considerable extensions of mains in the new streets of the city were effected in this period. The following figures enable comparisons to be made as to the working between the past and the preceding year:—

	1890.		1891.
Coal and cannel carbonized . .	18,750 tons.	..	20,438 tons.
Gas made	198,907,000 c. ft.	..	211,112,000 c. ft.
do. per ton of coal carbonized.	10,607 ,,	..	10,329 ,,
Gas accounted for	193,136,315 ,,	..	204,412,889 ,,
do. not accounted for . . .	5,770,685 ,,	..	6,699,111 ,,
Percentage of unaccounted-for gas	2·90	..	3·17

These figures show that there was an increase of 1688 tons of coal and cannel carbonized in the year, of 12,205,000 cubic feet in the quantity of gas made, of 11,276,574 cubic feet in the amount sold, and of 928,426 cubic feet, or 0·27 per cent., in the gas unaccounted for; while there was a decrease of 278 cubic feet per ton in the quantity made. The illuminating power and purity of the gas were practically as before. The number of consumers on the books at the close of the year was 6131; and 487 cooking-stoves, 815 gas-fires and heating appliances, 287 gas boiling-stoves, and 34 gas-engines were in use. With regard to the Water Department, Mr. Hepworth reported that the quantity of water pumped last year was 368,432,147 gallons, as compared with 332,602,237 gallons in 1889-90—an increase of 35,829,910 gallons. The average daily supply for all purposes was 24·03 gallons per head of population—an increase of 2·34 gallons.

The accounts accompanying the reports showed that in the Gas Department the receipts were £31,464; while the expenditure was £27,903—leaving the above-mentioned sum of £3560 to be carried to the profit and loss account, the balance of which at the 30th of June last was £3291 6s. 11d. In the Water Department the receipts were £7169; the expenses, £2420—leaving £4749 to go to the profit and loss account.

Mr. Hepworth also presented a working statement in reference to the Gas Department. It showed that the capital expended on the works and plant amounted at the close of the past financial year to £5 8s. 11d. per ton of coal carbonized, or 11s. per 1000 cubic feet of gas sold. With regard to residuals, the quantity of coke made was 10,856 tons, of which 8264 tons were sold, at the rate of 10s. 6¼d. per ton, and 2532 tons used as fuel. Of tar, 267,035 gallons were produced, or 13 gallons per ton of coal; and it realized 1·57d. per gallon. Of sulphate of ammonia, 197 tons were made—being 19·28 cwt. per 100 tons of coal carbonized; and it fetched, on an average, £6 19s. 10d. per ton. The net proceeds of the coke and other residuals were 46·32 per cent. of the cost of coal. The following figures are taken from the statement:—

	Cost per 1000 Cub. Ft. of Gas Sold. s. d.		Cost per Ton of Coal Carbonized. s. d.
Coal	1 7·29	..	15 10·09
Less residuals	0 8·93	..	7 4·05
	0 10·36	..	8 6·04
Wages and gratuities.	0 3·46	..	2 10·06
Repair and maintenance of works and plant	0 4·42	..	3 7·51
Salaries of Engineers and Inspectors.	0 1·25	..	1 0·35
Other expenses	0 4·82	..	3 11·64
Total coal and working expenses, less residuals	2 0·31	..	19 11·60
Sale of gas, rental of meters, and rents	2 3·87	..	22 10·68
Profit on gas manufacture	0 3·56	..	2 11·08

The Committee recommended that £3291 6s. 11d., balance of profits from the gas-works, be paid to the credit of the Corporation City Fund; and that the sum of £4695 1s. 6d., balance of profits from the water-works, be paid to the credit of the Urban Sanitary Authority District Fund.

Mr. FORSTER, in moving the adoption of the reports, accounts, and general minutes of the Committee, said he was sorry he could not congratulate the Council, as he did last year, upon a large sum of money, which had been made as profits, being handed over to the finances. It was no fault of management; it was simply that the cost of raw materials had gone against the Committee. About £3000 more had been spent thereon; and one would think that big concerns such as gas-works should be in a position to hand over a large sum in the shape of profits. However, the Committee had not advanced the price of gas, as had been done in nearly every other part of the kingdom, including London; and he believed the public would be satisfied with that. In Carlisle they did not contemplate raising the price. With regard to the water profits, he was glad he could congratulate the Council upon the handsome profit of £4700 on the year. The works were in a good condition; and much money would not be required in the way of repairs.

The MAYOR, in seconding the motion, said the Committee were in exactly the same position as every railway and other company consuming coals, the price of which had gone against them. They had done the best they could; and they lived in hope that another year they would be better off.

Mr. M'KEEVER supported the motion, but raised the question of whether the time had not arrived when the consumers of gas should be charged the actual cost of the gas, together with a certain sum for the maintenance of the permanent works. He argued that, under the present system, the incidence of taxation was not directly felt, and that the Corporation, when they contemplated carrying out any work, did not go to the citizens for their consent in a direct way, but applied the profits of the gas-works for the payment. The present price of gas was a fictitious one; and consumers ought to be charged the actual cost and an additional sum for the maintenance of the works. The revenue of the gas-works was not now sufficient to cover the interest on the capital; but, fortunately, they were not called upon to pay that interest to anyone but themselves.

Mr. WHITE said it was a popular delusion that the whole of the profits of the gas undertaking went in reduction of rates. In fact, they had already arrived at the time to which Mr. Hepworth had lately referred, and to which Mr. M'Keever had alluded, when the gas consumers would be provided with gas at cost price. Out of the £3291 which the Finance Committee were to receive from the Gas Committee as from last year's profits, £2000 would go in repayment of gas loans, and £910 for interest on those loans. Therefore, only a sum of about £291 would pass into the city fund that could in any way be applied in relief of the rates. With the water-works it was different. The £4700 they were going to receive went into the district fund, and did not go entirely in reduction of the rates, for they always took the water profits into consideration in making out the estimate for the district rate. He did not think Mr. Foster had explained as fully as he might have done what it was that had caused the decrease in the gas profits. They were told last year that they must not expect to get so much profit as in the year preceding; and the reason given was that there had

been a large increase in the price of the coal the Committee had contracted for. He believed he was right in saying that in the current year there was a small decrease in the contract price of coal, and that they might look forward to perhaps a little higher profit than they were now receiving. At present he had no hesitation in saying that the gas consumers of Carlisle were actually getting gas at cost price.

The reports and minutes were then confirmed.

THE GAS SUPPLY OF STALYBRIDGE AND MOSSLEY.

An interesting correspondence is going on in the columns of the *Ashton-under-Lyne Herald*, between the Chairmen of the Stalybridge and the Mossley Gas Committees, as to the cost of producing gas in the towns. Before their transfer to the Municipalities, the gas-works in Stalybridge and Mossley formed one undertaking, owned by the Stalybridge Gas Company. Since their division into two undertakings, a good deal of friendly rivalry has existed; and comparisons between them are continually being drawn. The present discussion arises out of a debate in the Mossley Town Council, in which Alderman Buckley, the Chairman of the Gas Committee, asserted that Mossley made gas cheaper than Stalybridge. This seemed so much like a challenge to the latter town, that Mr. G. H. Whalley, the Chairman of the Stalybridge Gas Committee, at once rushed into print in defence of his Committee and their Manager. Alderman Buckley replied, and an immense array of figures was quoted on both sides. The conclusion of the whole matter was well expressed by the Mayor of Stalybridge last week—"We are quite convinced," he said, "that we are doing as well as Mossley; and Mossley are convinced that they are doing as well as Stalybridge. The only difference is that, while Stalybridge get more and cheaper gas, Mossley get more for their residuals; and this is caused to a great extent by the manipulation of the different coals used." The two Chairmen are, however, still continuing their wordy and "figurative" warfare. Meanwhile the rivalry between the two Corporations has produced one satisfactory result. At Stalybridge, the salary of Mr. E. A. Loam was last Monday rather tardily advanced by £30 per annum; and on Thursday the Mossley Corporation followed suit and added £20 to Mr. R. Merrill's salary. In both cases many complimentary things were said about the excellent management of the works and the capabilities of the Managers.

Ottoman Gas Company, Limited.—At the half-yearly meeting of this Company, on the 22nd inst., the Directors will be able to report that during the six months to June last, the gas-rental amounted to £7835; and the net profit to £2657. The increased cost of coal, compared with the corresponding six months of 1890, was £537. The amount standing to the credit of the profit and loss account is £3161, out of which the Directors will recommend a dividend at the rate of 7 per cent. per annum on both classes of shares. This will absorb £2625; leaving a balance to carry forward of £536. The Directors report, with regret, the death of their esteemed colleague, Mr. Stephenson Clarke, who they say had always been of great assistance to the Company, and his decease is a very serious loss. His seat at the Board has been filled by the appointment of his eldest son, Mr. Stephenson Robert Clarke.

Dover Gas Company.—The half-yearly meeting of this Company was held yesterday week. The accounts which were submitted showed that the business was in an extremely satisfactory condition, and that the profits earned would pay the usual dividend at the rate of 7½ per cent. per annum, less income-tax. The total income had amounted to £16,347; and after meeting all expenses, the balance remaining was £2742. The Chairman (Mr. W. Mannering), in moving the adoption of the report, said that the profit and loss account, as compared with the corresponding period of the previous year, exhibited an increased revenue of £2483; and it was accounted for by the increase from gas of £1756, and residuals had returned £724 more. On the other hand, the expenditure had advanced by £966. He was glad to say that very good results had been obtained in the manufacture. They had sold 10,232 cubic feet of gas per ton of coal carbonized, which was proof that the stokers, under the management of Mr. Ralph Herring, were doing their work most efficiently. The quantity of gas sold was 78,323,700 cubic feet; being an increase on the corresponding half year of 1·33 per cent. During the six months, 7624 tons of coal were carbonized; being an increase of 57 tons. The report was unanimously adopted; and the meeting concluded with the usual complimentary votes.

Proposed Purchase of the Rushden Gas-Works by the Local Board.—The Rushden Local Board recently appointed a Committee to consider the question of purchasing the local gas-works. They consulted Mr. J. T. Lewis, of Wellingborough, on the subject; and a few days ago they presented to the Board his report. Mr. Lewis stated that he considered £6500 would be a fair value for the property, and the least that would be awarded by competent engineers if subject to arbitration. He thought the Company would accept a smaller sum; and that if its property and stock could be obtained for £5000, it would prove a most advantageous purchase on the part of the town. An additional £500, in cash, would be required to work the business. The present works had, however, nearly reached their maximum production; and some extension was necessary to meet the increasing consumption. Should the Board acquire the Company's property, he would strongly urge the erection of new works on another site, in preference to the enlargement of the existing works. He estimated that new works, capable of producing 15 to 20 million cubic feet of gas per annum, could be provided for £7000, and that their capacity could at any time be doubled at an additional cost of half that sum. Added to this £7000, the £5590 mentioned above made a total of £12,500, from which Mr. Lewis deducted £1000 for the present site and buildings. He thought the present was a very opportune time for making the purchase; and if the Board should acquire the property, and continued to manage it as successfully as the Company had done, the transfer would prove eventually a source of great advantage and profit to the town. The report was adopted, and it was decided that the matter should be referred to a parish meeting.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. FREDERIC LANE LINGING in the chair.

The SECRETARY (Mr. Magnus Ohren) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts, which were summarized in the JOURNAL last week (p.450).

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said that the profit on the half-year's working was not so large as the Directors thought it might have been; and this arose from circumstances entirely beyond their control. Coal had cost them £12,407 more than in the corresponding period of 1890; the total amount paid under that head being £42,011. These figures represented the highest price they had had to pay for coal since the great rise which took place about two-and-a-half years ago, and also the extra quantity of coal which they had had to carbonize during the half year, as compared with the corresponding period of 1890. The contract for coal expired in April last; and the Board had been enabled, he was happy to say, to renew the contract at a marked reduction. Still he thought it only right he should state that, even now, they were paying 50 per cent. more than they were before the rise in the price of coal took place. It would also be seen that they had had to pay £500 more for wages under manufacture; and there had been some expenditure in laying larger mains in certain parts of the district. There was one item in the accounts which he thought must have attracted the attention of the shareholders, and that was the law costs, amounting to £1091. A large portion of this amount had been incurred by the Company in defending their interests against what the Directors considered was an undue increase in the assessments. It was a very singular thing that although the parish authorities had copies of the accounts, had every information rendered them by the Secretary and Engineer, and knew the position the Company were in and that they had a declining profit, yet, in the face of all this, they persistently increased the assessment, and forced the Company to incur these enormous expenses for law and professional charges to prove their case and to show that the authorities were wrong. In some of the parishes, they had succeeded in reducing the assessment; in two other parishes they had settled the matter in a friendly spirit; while they had three that were hanging back, but the Directors entertained the belief that they would be able to arrive at an amicable arrangement with them. The dividend amounted to about £14,232; and to meet this, they had to fall back upon three resources. The first was the balance of £4478 brought forward from the previous half year; the profit on the half year under consideration, including the interest upon the investments, amounting to £4420; and they took from the contingent fund the sum of £5334. Thus they had been enabled, with all their troubles during the past two-and-a-half years, to maintain a low price for gas and to pay their way. In addition, they had the sum of £6142, the balance of the contingent fund, to aid them in paying the dividends that would become due in March, 1892. The Company's business was very progressive, as instanced by the fact that the gas sold in the half year was 12·87 per cent. more than in the corresponding period of 1890. It might be assumed that a good deal of this increase had taken place in consequence of the severity of the months of January and February and the dark days of March. But really it was not so to the extent that one would expect; for from some particulars given to him by the Engineer, he found that, taking April, May, and June—and these were considered to be summer months—and comparing them with the same months of 1890, they positively had an increase of 10 per cent. in the private rental. This was good evidence that they had not to fall back upon any extraneous aid in the shape of severe weather or dark days, but that they were really showing excellent progress. To meet this large increase, they had necessarily been compelled to lay out a considerable amount of capital on new works; and it would be remembered that, at the last meeting, he gave some details as to what they were then proposing to do. Those works were about being completed; and he might here mention that they would be obliged to make further additions in the way of a retort-house. The Directors had not up to the present gone into the question of making water gas, nor had they contemplated the adoption of inclined retorts. These systems, he believed, were being tried by other companies; and should the results be satisfactory, there was no reason why they should not be introduced into their own works, provided that, by so doing, they would benefit the interests of the Company. As to the call which was now in course of payment, that would be all paid on the 26th inst.; and this would conclude the powers the Company possessed of raising money under their three Acts of Parliament. But as he would have to address the shareholders upon the subject at the extraordinary meeting to be held after the ordinary one, he would not say anything more upon it at present. With regard to the private gas-rental, the increase had been £5857. The receipts for residuals had also been very satisfactory; being in excess of the amount received in the first half of last year by £4308. The tar was equally as good in respect to price, although it did not appear so in the accounts; and this arose from the fact that, during the months of January and February, the contractors could not possibly take it away, and therefore the Engineer was compelled to use it as fuel. The sulphate of ammonia and ammoniacal liquor also showed an improvement. As to coal, they had carbonized in the six months 46,515 tons; being an increase of 6329 tons. He was sorry to say that the coal had cost 18s. per ton, as against 14s. 8d. in the June half of 1890; being an increase of 3s. 4d. The capital only averaged £4 2s. per ton of coal carbonized; and this was considered exceedingly low. In other respects they were going on in a most gratifying manner; and he trusted that, when the half-yearly meeting took place next spring, the Directors would be able to submit more satisfactory results than they had been able to do on the present occasion.

Mr. J. GLAISHER, F.R.S., seconded the motion.

Mr. BESLEY observed that the meetings of companies would be of no avail if the shareholders were not allowed to offer suggestions, although,

the Directors knowing more about the business than the proprietors those suggestions might afterwards be shown to be ill-founded. In the present accounts there was one striking fact—that the Directors were proposing to distribute a great deal of money which had not been earned in the half year. Inasmuch as they were not under the sliding scale, there was not the same motive, as would otherwise be the case, for keeping the price of gas down at 2s. 6d. per 1000 cubic feet; and he would therefore venture to suggest—as he did most disinterestedly, being a consumer as well as a shareholder—that, under present circumstances, the price of gas ought to be raised. Then with regard to the item to which the Chairman referred—an item which, being professionally engaged in the matter, he (Mr. Besley) knew something about—viz., law charges, it appeared to him that he spoke as if there were pending the possibility of altering the quinquennial valuation; and if this was so, it must have been known by the Directors in January of this year. With regard to the quinquennial valuation and unjust assessments—and certainly they were unjust enough as far as public companies were concerned—the Assessment Committees and overseers appeared to do all they could to save individuals a small sum a year, while they squeezed every halfpenny they could out of the public companies; and this accounted for the large expenditure in respect of law charges in their own case. He should like to know if the Chairman could inform him whether the appeals to Quarter Sessions had been heard and determined; and whether there had been a supplementary list made in respect of the current year, and with regard to which they had a complaint to make.

Mr. Beeton said he would venture to remark, on the question of the assessments, that the matter might have been easily settled in an amicable manner between the Assessment Committee of the Lewisham parish and the Company. The old rateable value was £8425; and the parish put it up to above £10,500. They were quite prepared, however, to make an arrangement; but Mr. Ryde, on behalf of the Company, wanted to put the assessment at under £5300, which was unreasonable, after having been assessed at £8425, and the works having been extended. He was afraid that the Directors had listened too much to Mr. Ryde; and, as a consequence, they had not only caused the parish to spend £1000, but they had themselves increased their law expenses, besides having a higher assessment.

Mr. W. H. Bennett inquired whether the sale of the contingent fund had the effect of destroying it; or had the Company the power to apply a portion of the future profits in re-establishing the fund.

The Chairman said he was exceedingly obliged to Mr. Besley for the remarks he had made; and he was sure he would permit him to say that, however good his suggestion might be, they were prevented, by the 31st section of the Gas-Works Clauses Act, 1847, from raising the price of gas at the present time. The reserve fund amounted to £40,000 invested in Consols; and as they were only allowed to have one-tenth of their capital as a reserve, the fund was full. This being so, it would be undesirable for the Company to increase the price of gas; but, as the Directors had never hesitated to reduce it when possible, so, if the shareholders' interests were in danger, they would not hesitate to increase it. With regard to the remarks that had been made by Mr. Beeton, he (the Chairman) could only say that the Directors must necessarily be dependent upon their legal and professional advisers. In the case of the parish of Lewisham, the authorities insisted upon the assessment being put up to £10,500; and the Company succeeded in getting it reduced by £1500, so that it now stood at £9000. The whole of the parishes attempted to increase their assessments unduly. He had been a Director of the Company now for more than 30 years; and during that time it had been the invariable custom of the parishes to increase the assessment when they had the opportunity, and so run the Company into law and professional charges. As to the contingent fund, this was introduced some 20 years ago. At that time gas legislation was not so clearly defined by Parliament as it was now. It was then thought that, in addition to the reserve fund, there might be a contingent fund in case of any extraordinary accident to the works; and so, under the advice of Counsel, it was introduced. He was prepared to say that no gas company would introduce a contingent fund at the present time. The fund was made up of profits obtained from the consumers; and it was legitimately going back to them by being used to pay the dividends, instead of increasing the price of gas.

Mr. Besley said he might also point out that, the contingent fund having been taken from the profits, if the Inland Revenue had charged income-tax upon it, the Company ought not to pay it over again when distributing it among the shareholders.

The motion was then carried.

On the proposition of the Chairman, seconded by Dr. F. Hetley, dividends were declared at the following rates per annum: 6 per cent. on the preference stock, 7 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the ordinary 7 per cent. shares, all less income tax.

A vote of thanks to the Directors for their able management of the affairs of the Company was then passed, on the motion of Mr. Besley, seconded by Mr. Bennett.

The Chairman, having responded, proposed that the thanks of the meeting be given to the Auditors and officers for the efficient discharge of their duty.

Mr. A. T. Layton seconded the proposition, which was unanimously carried.

Mr. Alfred Lass, F.C.A., briefly replied on behalf of the Auditors and the officers.

An Extraordinary Meeting was then held for the purpose of passing the following resolution: "That the Directors be, and they are hereby, authorized to augment the capital of the Company by creating 6 per cent. debenture stock to the amount of £37,500, instead of borrowing that sum; being the amount of capital authorized to be borrowed under the Company's Act of 1873, clauses 11 and 13. And they are hereby authorized to issue such debenture stock at such date as they may hereafter decide upon; such debenture stock to be issued to the stockholders and shareholders *pro ratâ*, of such amount as will conveniently allow the same to be apportioned among the then holders of stock and shares respectively in proportion as nearly as conveniently may be."

The Chairman, in moving the adoption of the resolution, explained that the Company had raised, under their three Acts of Parliament, including the call which was now being paid, the sum of £400,000; so that they had exhausted their power of raising money so far as the ordinary capital was concerned. By clauses 11 and 13 of their Act of 1873, they had power to issue debenture stock at a rate of interest not exceeding 6 per cent. per annum. The present meeting was therefore called for the purpose of enabling the Directors to raise the £37,500 mentioned in the resolution. This capital would be issued to the shareholders *pro ratâ* at par; so that whatever benefit accrued in the market value of the property, they would be entitled to it. He could not tell exactly when they would require the money, because it depended upon the time when they would use it for carrying on the extensions of the plant—it might, however, be about next March. He concluded by reading the two clauses of the Act of 1873 referred to in the resolution.

Mr. J. Glaisher seconded the resolution.

Mr. Besley remarked that it appeared to him that clause 11 provided for the issue of mortgage debenture stock, which, of course, was a very different thing to ordinary debenture stock; and with regard to clause 13, it empowered the Directors to issue up to £37,500 of preferential stock—not mortgage debenture stock. Could the Chairman, he asked, give him any information on this point.

The Chairman said that the Directors considered they were issuing this capital as fixed debenture stock under the clauses referred to; and, in reply to Mr. J. Chapman, he repeated that the Directors required this additional capital for the purpose of meeting the growing demands upon the Company's works.

The resolution was unanimously carried; and the proceedings then terminated.

British Gaslight Company, Limited.—At the half-yearly meeting of this Company on the 30th inst., the Directors will recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share.

Street Lighting in San Francisco.—It is stated that it costs the people of San Francisco between $250,000 and $300,000 a year to light the streets of the city. This includes the cost of gas, also that of the electric lights and repairs to lamps.

Gas Cooking Lectures at Dublin.—The Alliance and Dublin Consumers' Gas Company have recently had a course of lectures on cooking by gas delivered by Mrs. Page in the Leinster Hall; the stoves used for the purpose of illustrating them being the latest designs produced by Messrs. John Wright and Co. Yesterday week a special *déjeuner* was prepared by Mrs. Page and her assistants, to which several prominent citizens were invited by the Secretary of the Company (Mr. W. F. Cotton).

Newmarket Gas Company.—At the recent meeting of the Newmarket Gas Company, the Directors submitted accounts which showed that there was a net balance of profit available for dividend of £3240; and they recommended that this should be appropriated in the payment of a dividend (free of income-tax) at the rate of 11 per cent. upon all the capital. This would absorb £2890; and leave the sum of £350 to be carried forward to the current year's account. The Chairman (Mr. R. Stephenson), in proposing that the report be adopted, said that in 1890 the dividend amounted to 11 per cent.; but he told the shareholders at their last meeting that he could not promise them a similar dividend in 1891, there having been a rise in the price of coal. Owing, however, to the exceptional length and severity of the winter, a considerable quantity of gas was used for cooking and lighting purposes; and this had enabled them to again announce a dividend of 11 per cent. The works had been maintained in a good and efficient state by the Manager (Mr. J. H. Troughton), and they would compare favourably with those of any other town. Mr. Diver seconded the proposition; and it was carried unanimously.

The Crystal Palace Gas Company and their Assessments.—At the meeting of the Croydon Board of Guardians last Tuesday, the Assessment Committee reported as follows: "The Committee have fully considered the appeal of the Crystal Palace District Gas Company against their assessments in the parish of Croydon and the hamlet of Penge—viz., £1750 gross, and £1250 rateable value, and £2017 gross, and £1717 rateable value respectively. It was resolved that the Board of Guardians be requested to give their consent to the appointment of a valuer by their Committee to revalue the works the assessment of which is appealed against." Mr. Berry, in moving the adoption of the report, said that the Company had made an appeal for an enormous reduction; and the Committee had not felt themselves competent to arrive at a valuation of the property without skilled assistance, particularly as it was quite possible the matter would result in litigation. The report was adopted. (The question of the assessment of the Company's property was referred to at the meeting of the shareholders last Friday, a report of which appears above.)

Water Gas in Canada.—Some time ago, a letter appeared in the *Financial News* asking for information with reference to water gas; the writer stating that it was much used throughout Canada. A reader of the paper, feeling interested in the subject, passed on the inquiry to a friend who has resided for many years in the Dominion; and his reply, which has just been received, is as follows: "The writer is wrong in part, as water gas is not in universal use here [St. Thomas, Ontario]; in fact, I doubt if one-half the cities and towns burning gas use it. I know Toronto uses it; and when I resided there I have, on occasions, heard it condemned. One reason given was its liability to condense in the pipes; necessitating a daily examination and pumping the condensed water out of the little reservoirs placed at intervals along the route of pipes. Another reason is that the gas not having much smell, as coal gas has, any escape by leakage is liable to be overlooked. I have made inquiries regarding its manufacture, cost, and general use, without receiving any satisfactory answers; merely ascertaining that it is made of water decomposed, and that it is much cheaper than coal gas, where made in large quantities. But taking into account its condensing proclivities, together with danger to health and life by its not smelling where there may be a leakage many communities steer shy of it."

THE MUNICIPAL OWNERSHIP OF QUASI-PUBLIC WORKS.

In the course of an article on "A New Trades Union Development," in the JOURNAL for the 4th ult., reference was made to the fact, already noticed in our editorial columns, that the authorities of the Toronto University had taken steps to instruct the general public on the subject of the regulation of gas supply; and, in this connection, a paper on "The Municipal Ownership of Quasi-Public Works," read by Mr. Allen R. Foote before the Baltimore Taxpayers' Association, was mentioned as bearing upon the question under discussion. It was then impossible to do more than quote the portions of the paper that were specially apposite; but the full text, which is given below, will doubtless be interesting to many of our readers.

I learn from my teachers, the critics, the urgent need of so defining terms that they cannot be misinterpreted. If I can do this, I shall not only succeed in conveying the meaning I intend, but shall secure the advantage of compelling my critics to show the fallacy of my meaning instead of the fallacy of the construction they give to it.

The economic laws of which I speak are not enacted. They exist. They are a part of the wondrous system of natural laws by which the universe is governed. They are helpful or destructive to man in the degree in which he rightly interprets them, and of his willingness to act in harmony with them. Through them all forces must find expression that make for comfort, right-doing, and justice among men. They govern the production, distribution, and consumption of wealth.

The true functions of government are, to promote intelligence, care for the unfortunate, and establish justice. I am told this is too narrow a definition; so I will cast it in a different form. The true functions of government are to do all things necessary to promote individual prosperity and the public welfare that cannot be as well or better done by private enterprise. In no way can a government so surely do this as by arranging conditions to secure to the poorest labourer an increasingly better opportunity to gain wealth by the use of his own intelligence, energy, and tools. To this end a government must guarantee the unrestricted operation of economic laws and co-operation with their requirements, which are: (1) That the product shall belong to the producer; (2) unrestricted use of tools; (3) undisturbed enjoyment of the surplus saved. Labour, tools, care, and self-control are active wealth-producing factors. The expenditure of brain or muscular energy is labour; the means by which energy is applied to effective work are tools; the surplus saved is wealth. The margin for saving is the difference between the cost of living for a day and the value of the day's labour.

The labourer possessing the greatest degree of economic intelligence will use tools of the highest efficiency with accurate skill; he will also exercise the most thoughtful care and greatest self-control. Production and consumption, so ordered, will greatly exceed the cost of living, though the standard of living be of the highest. The labourer possessing the least degree of economic intelligence will use tools of the lowest efficiency with little skill; he will also exercise the least thoughtful care and self-control. Production and consumption, so ordered, will hardly cover the cost of living, though the enforced standard be the most meagre that will sustain life.

The difference between the cost of living, at their respective standards, of two such labourers does not equal the difference between their capacity to produce and save. For this reason, while each may be gaining in wealth, the one with greatest economic intelligence will gain much faster than the one with the least economic intelligence. Relatively, "the rich will grow richer and the poor poorer;" and that without an injustice or a wrong of any kind being done. This is a fundamental condition. It cannot be changed by legal enactment any more than the relative value of gold and iron can be so changed. If the normal difference between the wealth-gaining capacity of two labourers is as 10 : 1, then any possible change of conditions that does not infringe individual freedom will not change the advantage of the one over the other. The only way to overcome the difference between them is by increasing the economic intelligence of the least intelligent.

If a labourer cannot own the wealth resulting from his labour and saving, he is deprived of the most potent inducement that can give "vim" to his labour and watchfulness to his saving. An old proverb says: "The hope of reward makes the labourer sweat." Labour without profit is slavery. When the labour of a day produces only sufficient to support life for a day, the labourer is a slave. Slaves do not receive wages. They are simply provided for as domestic animals. The epoch-making change that transformed the poorest labourers into wealth accumulators, was the substitution of wages for support. It was simply a change of conditions which enabled economic laws to pass through new channels; just as the waters of a river running through an arid plain may be diverted to fertilize the land. This is not done by compelling water to run up hill.

The change from support to wages was in harmony with the requirements of individual freedom. The next epoch-making change that will enable the poorer members of society to become richer will be in the direction of profit-sharing. This change will also be in harmony with the requirements of individual freedom. There can be no profit-sharing where there is no profit to be shared. Profits are the joint production of labour, care, and self-control.

The economic intelligence that is necessary to raise the poorest labourer in the scale of efficiency will teach him that he cannot acquire wealth honestly except it be by securing his equitable share of the profits of the business in which he is engaged. It will teach him that the domain of private enterprise for profit-making cannot be restricted without closing the highways to wealth for wage-earning labourers. It will teach him that the economic problem is: How can a labourer increase his income without increasing his expenses?

The fundamental principle of Trades Unions is that one labourer shall not take the place of another unless the vacancy is created for a just cause. This stops competition and creates monopoly. The terms of the monopoly are that a labourer shall occupy the place he may have, unmolested by a competitor, so long as he performs his duties with reasonable satisfaction. In order to prevent the lowering of the standard of living, Trades Unions have found it necessary to go a step beyond protecting the labourer in his right to his place, and demand that he shall not be discharged simply because another can be found to take his place at less pay. It is the object of Trades Unions to protect the labourer in his occupation, and to maintain the standard of wages. Within the limits so fixed, wage labourers find their margin of profit. Trades Unions have no reason for their existence unless it be to protect labourers in their occupation, and to maintain the right to a profit for the producers of the profit.

To protect the labourer in his occupation is the object of civil service laws. Members of Trades Unions should be loyal supporters of such laws, and demand that all officials who have control over the employment of labourers shall obey them in letter and in spirit. By so doing they will free Government employees from being used as the tools of politicians, and will secure a public demonstration of the beneficial effect of their principles when practically applied. Trades Unions are attempting to apply to practical affairs ethical and religious standards of right-doing. Their action is based on the fundamental economic law: "Thou shalt not steal."

Those most conversant with the history of Trades Unions know that the conditions most fatal to the prosperity of labourers are uncertainty of employment and uncertainty of payment. They know that the shorter the term of employment, the higher the rate of wages must be; otherwise the labourer will be placed at a great disadvantage through loss of time between jobs. Everything that tends so to fix conditions that employment will be continuous, pay sure, and wages remunerative, they know to be directly in the interest of the labourer. It is under such conditions that labourers locate, become thrifty, make for themselves homes, and prove valuable members of society. It is under such conditions that labourers secure the best opportunity to increase their economic intelligence and acquire wealth.

Wealth is always an accumulation saved from the past. So far as its possession relieves the necessity for present expenditure, it has economic value. If a labourer owns a home free of debt, the funds he would otherwise pay for rent can be applied as tools of production either by himself or by another. If by himself, they will increase his earning capacity. If by another, he will demand pay for their use, in the form of interest or profit, as his share of the product produced by them.

The first step in the solution of the economic problem is to save. The second step is to invest the surplus saved in those objects the possession of which will relieve the labourer from the payment of some portions of his expenses—notably a home. Amounts saved from the payment of expenses are a direct addition to income. When the labourer owns those objects for the use of which he otherwise must necessarily pay rent or interest, he increases his income by the amount of such payments. He also has the amount of the payments made as principal to employ in profit production. In this way his savings become tools of production directly applied to his own affairs. The third step is to loan his tools to another, who by the use of them can increase production sufficiently to enable him to pay for the use of the tools, and still have a surplus remaining for himself. When this can be done, both parties to the transaction are gainers by it. The fourth step is to secure a share of the profits of the business in which he is employed by employing his tools in it. Each step will make a direct addition to income without involving a necessary increase in expense. Each step taken will make easier the taking of the next. "Man gains the strength of the difficulties he overcomes." Start right, and each step taken will add immensely to the momentum by which progress in the accumulation of wealth may be made.

No labourer can study this problem intelligently without realizing the supreme importance of security and perpetuity for his own occupation and for the use of his tools. Loss of employment, loss of pay, loss of principal, and loss of interest, mean retardation in securing industrial liberty. Through making a saving, and then using that saving as a tool of production to increase his own productive capacity, a labourer may increase his income continuously, until the amount he receives as the earnings of his tools will equal the amount received from his own labour. He can then retire from his employment, and live without labour in the unquestioned enjoyment of his wealth. Interest and profits are the locomotives that labourers must employ to carry them to the stations of comfort and independence on life's highway. Labourers must produce a profit, or they cannot be continued in employment. Tools must produce a profit, or they cannot be continued in employment. If the labourer accepts fixed wages, taking no risk in the contingencies of the business, his margin for profit is included within the amount of his wages. If he is permanently employed at a guaranteed rate of wages, he can afford to, and does, accept a less rate of wages than when his employment is temporary. If the owner of tools accepts fixed interest, taking no risk in the contingencies of the business, his margin for profit is included within the amount of his interest. If his tools are permanently employed at a guaranteed rate of interest, he can afford to, and does, accept a less rate of wages than when their employment is temporary.

Labour and tools are two names for the same thing; wages and interest are two names for the same thing. Conditions arranged to impair one will inevitably impair both. Conditions intelligently arranged to benefit one will inevitably benefit both. Wages and interest are a guaranteed payment for service, without participation in profits.

Enterprise is born of hope. The hopefulness of human nature has no stronger illustration than the fact that division of profits is the feature always calculated upon, while division of losses is the feature never presented. Those who accept a guaranteed payment in full for services waive the right to participate in profits, and are protected from being called upon to participate in losses. If an enterprise produces a loss instead of a profit, those who accepted the risk, with the hope of making a profit, must pay the losses. No one will deny that the loss belongs to the risk; no one can intelligently deny that the profit belongs to the risk as well. Economic laws governing industry are perfectly clear. They are in accord with the requirements of personal liberty, with ethical and righteous justice. Payments for service, without the right to participate in profits, whether wages or interest, must be without risk. Profits belong to those who risk the making of losses. The expectation of securing a profit is the only justification

for making a venture. The profit expected should be in proportion to the liability of loss.

It may almost be inferred from the foregoing that progress in the accumulation of wealth can be predicted to a mathematical certainty. I have no doubt the time will come when this can be done. It cannot be done now, because the voters who fix conditions by legal enactments are not guided by sufficient economic intelligence. The contingencies of life and industry are multitudinous. They render the problem of accumulating wealth the most complex the mind is called upon to solve. The labourer may suffer loss of time, impairment of ability, or an increase of expense through sickness or accident occurring to himself or to members of his family. Tools will certainly wear out or be broken while in use. Death may deprive a family of the income of its producer. Fire or other catastrophe may destroy the tools of production. By means of a carefully-kept record, covering a sufficient period, and a sufficiently large number of cases, a table may be made showing what percentage of income, regularly set apart for the purpose, will provide a reserve fund sufficient to make good all such impairments. When so guarded, life and industry will sustain the least possible hindrance from such contingencies. The amount of percentage necessary to provide a guarantee fund is a fixed charge on industry, and must be included in the cost of production.

For convenience, the economic problem of production, distribution, and consumption of wealth may be studied under three divisions: (1) Domestic—treating of personal or family income and expenses, the income being derived from wages, interests, or profits drawn from industry. (2) Industrial—treating of income and expenses of industries, operated under private ownership; the risk of loss being assumed for the purpose of securing an expected profit. (3) Governmental—municipal, state, or national, treating of public incomes and expenses, undertakings non-commercial, designed to promote public welfare, and not for making profit.

Private industry is the only source of profit. It is evident that the smaller are the demands on industry or domestic and governmental expenses, and the less private enterprise is restricted, the greater the margin of profit will be. For this reason, intelligent economic action will always tend to lessen the demands and restrictions upon private industry, in order to encourage individual enterprise. This can be done in no way more surely than that pointed out as one of the fundamental principles of the International Labour Congress Association—viz., "Recognition of the fact that the productive forces, if unrestricted in their action and properly organized, are capable of abundantly supplying the reasonable wants of the people; and that, therefore, discussion should be concentrated on the removal of the restrictions, the scientific organization of production, and the equitable distribution among the producers of the product of their labour." This means the encouragement of industry. It is not, however, sufficiently comprehensive. It should include scientific economy in consumption, as well as scientific economy in production and distribution. There can be no scientific organization of the production, distribution, and consumption of wealth without a correct knowledge of economic laws, and the effect of their operation on the affairs of life and industry. This requires properly-classified accounts, showing in full all items and details influencing results. Correct principles, rightly understood, are infallible guides to correct conclusions. Those deficient in economic intelligence do not understand the abstract principles involved in this problem, and therefore cannot be guided by them. For this reason, they must be taught by the developments of experience. Proper accounts, correctly kept, are absolutely necessary for their guidance. Accounts are the alphabet of economic intelligence.

In the final analysis, it will be found that the conditions under which labourers work and industries operate may be changed, but that economic laws are changeless. With a correct knowledge of these laws, no labourer will ever approve of encroachments upon the domain of private enterprise by changing a profit-producing industry under private ownership into a non-profit-producing industry under government ownership, be it municipal, state, or national.

The question of municipal ownership of *quasi*-public works will never be correctly or permanently settled until it is settled in conformity with the requirements of economic laws. This demands an exhaustive and exacting examination of the premises; for the thing that can be the least afforded is to be superficial, and to form a judgment on insufficient evidence. I have examined, as fully and carefully as possible, the representations made by those favouring such ownership for American cities, and have not found a single instance in which this policy has been advocated for purely economic reasons. The demand issued from college professors who have developed sentiment at the expense of judgment; from clergymen who have not learned that the proper observance of economic laws will cause God's will to be done on earth; from poor labourers deficient in economic intelligence, who think their only way to wealth is through pulling down the wealth of others; and, lastly, from politicians, who think such measures will help to make votes for them, and who know that, if adopted, they will increase the number of voters dependent for employment on public service under their administration. Voters can be politically independent only when they are industriously independent. Whatever motives may influence them, there is but one reason that can be given for desiring a municipality to undertake the ownership and operation of *quasi*-public works. It is that thereby the public will obtain an economic advantage.

To prove the economic advantage gained for the public from such ownership, reference is made to statements published by those in charge of such works, showing the low cost of the service. I am not surprised that clergymen, labourers, and politicians give currency to such statements, without submitting them to a thorough analysis, when I find professors of economy setting them the example. I have requested professors of economy, and I now request all who favour or disapprove of the policy of municipal ownership of industries, to join in an agreement as to what items should be included in cost, and then to see to it that such items are honestly included in all statements of cost which are accepted as a basis for judgment. I claim that, until such a basis is agreed upon, and accounts are submitted in accordance with its requirements, that it is the part of wisdom for every municipality to avoid decisive action.

You cannot afford to commit your city to an economic policy that is not well considered, under any circumstances; and least of all can you afford to do so on the evidence of statements of cost that are not verified. You may estimate that a block of marble weighs but half a ton; but if it really weighs a ton, and you provide but half-ton supports for it, you will be powerless to prevent its falling. I believe there is not a municipality in the world owning and operating *quasi*-public works that has gained an economic advantage by means of such ownership. In making this statement, I wish it to be distinctly understood that I do not raise the issue of personal dishonesty or official corruption. I believe those advocating the policy of municipal, state, or national ownership of industries to be morally honest, but deficient in economic intelligence.

A corporation is a legal person. It is governed by economic laws exactly as individuals are. Economic conditions that are best for the poorest labourer are best for the strongest corporation. Trades Unions demand that labourers shall not be disturbed in the tenure of their employment. They demand that a labourer shall have the exclusive right to his position so long as he performs his duties with reasonable satisfaction. Exclusive and perpetual tenure of possession is the one feature of supreme value in the title to all property. Without this qualification, no real estate title is perfect; without this guarantee, no permanent improvements of great value are made. Such an economic condition is fundamental. In the case of *quasi*-public works, this means an exclusive and perpetual franchise. That is monopoly. All such works are natural monopolies; they can be developed in a way to secure for the public the truest economic advantage only in conformity with natural economic conditions.

I ask you to look into this question deeply. If a municipality is a business corporation, with a power of eminent domain over the property within its boundaries, then it is its manifest duty so to order its affairs as to increase the aggregate value of that property. This can be done only by promoting private industry and enterprise. No one can deny that the most potent stimulus that can be given to private industry is the certainty of securing a satisfactory return for the energy expended. This return is always reduced by the percentage required for government expenses. A government cannot pay for anything without extracting the funds out of the profits of private industry. There cannot be, economically considered, any such thing as a governmental profit. If a surplus is created by any government operation, it is obtained only by extracting more from the profits of private industry than the service required. Every per cent. deducted from the realized profits of industry is a restriction on the production of wealth; every per cent. retained in the realized profits of industry accelerates the accumulation of wealth.

(To be continued.)

THE CONGRESS OF HYGIENE AND DEMOGRAPHY.

Papers Relating to Water Supply.

In the JOURNAL for the 25th ult. we gave the papers dealing with the subjects of an auxiliary water supply for the Metropolis and the self-purification of rivers, read by Mr. A. R. Binnie and Dr. Percy F. Frankland at the above-named congress. A few other papers bearing upon water supply have now to be briefly noticed.

The supply of water by the system of double distribution, as carried out in Paris, was dealt with by Mr. Bechmann, Chief Engineer of Bridges and Roads. He stated that this system had been in operation since 1854, and it possessed two certain advantages—viz., it reduced to a minimum the quantity of pure and salubrious water necessary to meet the requirements of the population; and it improved the service to the upper floors of houses, which was rendered independent of that of the street. He did not for a moment deny that the duplication of the distribution arrangements was a very serious matter, first of all from the point of view of the initial outlay, and then from the possibility of the two supplies being confused. He nevertheless came to the following conclusions: (1) That the ideal water supply of a town consists in the uniform distribution of potable water suitable for all purposes. (2) That, should particular exigencies necessitate the expedient of a double service supplying two waters of different qualities, only one of them being potable, this service ought not to be introduced into private houses, where only potable water should be at the command of the consumer.

Mr. W. Matthews, M. Inst. C. E., F. G. S., followed with a paper on the same subject, dealing specially with Southampton, of which town he is the Water Engineer. He said that until 1852 Southampton depended for its water supply upon the surface drainage from the Common and adjacent lands, which was collected and stored in two reservoirs situated on the Common, at a level of about 60 feet above the town, and holding together 5 million gallons. A well and boring were also sunk near the upper of these reservoirs, with the object of obtaining water from the chalk. The scheme was, however, a complete failure; and the boring was abandoned at a depth of 1317 feet, after having involved an expenditure of upwards of £20,000, and yielding less than 100,000 gallons per day of water of indifferent quality. A supply pumped from the River Itchen was introduced in 1852; and it remained in use until 1888, when new works were established, drawing a supply from wells sunk in the chalk, eight miles to the north of Southampton. The water from this source was abundant and of great purity, but somewhat hard; and to remedy this a softening process had been adopted with great success, the working expenses being less than ¼d. per 1000 gallons. This water was delivered partly direct to the town and partly into reservoirs situated at the top of the Common, 160 feet above the town, and holding 5 million gallons. It constituted the domestic supply, and was distributed throughout the town in the usual manner. For many years prior to 1888 the water collected from the drainage of the Common was suffered to run to waste; but upon the new works being initiated, the author drew up a scheme whereby this water could be used for sanitary purposes, and a saving effected in the consumption of that from the new works, which had to be pumped and softened at considerable cost. A line of pipes was already in existence, leading from the two old reservoirs for some

distance into the town, and this was put in working order and utilized as the main supply for sanitary purposes from these reservoirs. There were also duplicate mains in some streets which were quite unnecessary, and these were severed from the domestic supply and connected with the sanitary supply. About this time, too, it became necessary, owing to the increased pressure of water arising from the abatement of waste, to renew the pipes in a great number of streets; and as the sanitary supply was arranged to work under a much lower pressure, the old pipe-lines, instead of being removed, were incorporated in the sanitary supply system, and gradually, as this work of renewing mains went on, the sanitary system would be spread all over the town. At the present time there are nearly seven miles of such mains, and upwards of one-third of the roads in the town are now watered from this supply. The water is used exclusively for public purposes, such as road watering, sewer flushing, to urinals, and the like; no connections being made with houses under any circumstances. In very dry weather it is found that the drainage from the Common is insufficient for the sanitary supply; and to meet any unusual demand, an auxiliary supply has been established. The deep well on the Common, as before stated, yields from 90,000 to 100,000 gallons of water per day, and this is pumped up by hydraulic engines working a set of well pumps and delivered into the sanitary reservoirs. Power to drive the engines is obtained from the 18-inch high-pressure domestic supply main, which passes close to the well on its way from the reservoirs at the top of the Common to the town. An 8-inch bye-pass is fitted to the 18-inch main, and the engines work on the bye-pass. The water is admitted at a pressure of 20 lbs., and exhausted into the main at a pressure of 5 lbs. to the square inch. No water is thereby wasted; and the loss of pressure on the main is of no consequence, as the full pressure is more than is required, and the engines are only at work for a few hours each day in the dry weather. The author remarked that secondary supplies had not been adopted in many towns in this country; and where it had been done it had been chiefly in connection with sea-water supply. But he was of opinion that in many places there existed supplies which, although unfit for domestic purposes, might be obtained by gravity, and by the judicious use of existing mains, as at Southampton, distributed for sanitary purposes at little cost. One great benefit which arose from the use of a separate and cheap supply was that there was less tendency to be sparing in the use of water for sanitary purposes. Whereas where the water used for this purpose had to be pumped and distributed at heavy cost, the great object of the authorities was to reduce the consumption to a minimum.

In the discussion which followed the reading of these papers and that by Mr. Binnie (already given), Dr. E. Frankland remarked that the importance of good and pure water supply was happily now being more widely recognized. In the case of infectious diseases, this was especially the case. At one time sewer gas was looked upon as the chief offender in this respect; but it was now recognized that infectious matter, being solid, could only be carried to a very limited extent by a gas. There was a way, however, in which sewer gas could become the vehicle for carrying infection. If it were made to pass through germ-infected water, bubbles would be formed, and these might float about and so carry infection. He was decidedly adverse to a dual water supply for towns, as there was danger of the impure water, either through ignorance or carelessness, being used for drinking or cooking purposes. Mr. Baldwin Latham pointed out that an underground supply might be polluted, and carry the germs of disease long distances. Even wells in the chalk were not, he said, beyond suspicion—a fact which he illustrated by one or two examples. Professor Robinson also was not in favour of the dual water supply; but he advocated a continuous supply, looking on the intermittent system as very unsatisfactory. He said he did not believe that organisms were removed by filtration through sand. Dr. Odling expressed the opinion that the danger did not arise so much from living organisms as from spores. The former were, he said, destroyed by running water, while the latter were not. He believed that spores were capable of being largely destroyed by the human stomach, and were not liable to be harmful unless taken in large quantities. He did not believe that a single one would multiply as it did when artificially cultivated in gelatine. Mr. Binnie said he did not think there was much to be gained by the dual system; at the same time he did not suppose there were two opinions as to condemning the intermittent system, and advocating a constant supply. With regard to filtration, sand would remove visible dirt; but it would not render contaminated water free from danger.

As bearing upon the question of the utilization of river water for domestic purposes, Dr. W. Anderson read a paper describing his revolving water purifier, which has been frequently mentioned in the JOURNAL. He explained that it was invented in 1884-5 to meet the difficulties which arose in working the spongy iron filters, which gradually became choked up at the Antwerp Water-Works. The purifiers had given most satisfactory results. The apparatus, it may be remembered, consists of a cylinder supported horizontally on two hollow trunnions, of which one serves for the entrance and the other for the exit of the water. The cylinder contains a certain quantity of metallic iron, in the form either of cast-iron borings, or preferably, of scrap iron, such as punchings from boiler-plates. The cylinder is kept in continuous but slow rotation by any suitable means; the iron being continually lifted up and showered down through the passing water by a series of shelves or scoops fixed inside the shell of the cylinder. By this means the water, as it flows through, is brought thoroughly into contact with the charge of iron, which, in addition, by its constant motion and rubbing against itself and the sides of the cylinder, is kept always clean and active. Simple contrivances for preventing the iron from being carried out of the cylinder or piled up at the outlet end, and for distributing the current of water over the whole area of the cylinder, are also furnished. The water as it leaves the cylinder appears to have undergone only one change of any importance—viz., a quantity of iron, ranging from 0·1 to 0·2 grain per gallon, has been taken up; and to get rid of this the water has to be aërated, either by blowing in air, or by merely allowing it to flow along a shallow open trough. In both cases repose in a settling reservoir is necessary. After a few hours—from two to six in most cases, much less in some—the greater part of the iron will have subsided to the bottom of the tank, usually as loose flakes of iron peroxide associated with organic matter and other impurities; and the water is then ready for filtration. In most cases a rapid passage through a shallow layer of sand is all that is required to separate the iron, which remains as a fine layer on the surface of the sand, while the water issues from the filter free from iron, greatly ameliorated as regards organic matter, and practically deprived of microbes. The apparatus has been fitted at Boulogne-sur-Seine, where very exhaustive tests have been made, and these were quoted at length by the author. Stated briefly, it may be said that the improvement in respect to the elimination of organic matter amounted to from about 40 to 82 per cent. The average was above the mean of these figures. It has been asserted that the quantity of free oxygen dissolved in the water is seriously diminished by the process; but this the author denies, and supports his opinion by chemical reasoning. At Agra and Monte Video the system has also been adopted; and at Molesey Lock an experiment is now being tried on a practical scale.

The water supply of maritime, as distinguished from inland, towns was dealt with in a paper read by Dr. E. F. Willoughby. He included among "maritime towns" such cities as London and Glasgow, and even Manchester and Paris, which are situated on the tidal reaches of rivers, or at any point in the course of a river where it has ceased to perform its function of fertilizing the adjacent lands. These differ from inland towns in the fact that, whereas in the latter, especially if their sewage is disposed of by irrigation, the whole of the water taken from the land, whether from rivers or wells, is sooner or later returned to it, in the former the water withdrawn from the land is discharged, directly or indirectly, into the sea. The effect of this in the case of London is progressive depression of the level of the water in the wells, and the drying up of the rivulets in the basin of the Thames; showing that the volume annually abstracted is already in excess of the supply, and that such a course cannot be persisted in without disastrous effects on the fertility of the country. Maritime towns must therefore have recourse either to districts where the rainfall is in excess of the local requirements of the vegetation and population, as mountainous areas, moorlands, and lakes, or to a source hitherto entirely ignored by engineers—viz., to supplies which find their way to the sea without giving rise to rivers; in other words, which at present run to waste. The South Downs, or chalk hills of Sussex, through which the surface drainage of the Weald, together with the local rainfall, flows into the sea, and from which source Brighton is supplied, furnish the only instance of the utilization of such waste water; though it is believed that the like natural waste takes place into the estuary of the Thames from the chalk hills of North Kent—a conclusion based on geological and hydrological evidence, and one which was held by the late Professor Ansted. Both of these sources might, in the author's opinion, be made available for a potable supply to London. Though the case of Brighton and the South Downs is typical, and perhaps alone in the magnitude and the completeness of the natural waste now utilized, it is believed that the like conditions will be found to present themselves on almost all shores where lines of hills run parallel to the coast, provided the dip of their strata is not downwards inland.

The influence of ground water upon health was the subject of a paper read by Mr. Baldwin Latham, M. Inst. C. E. It may be remembered that the author brought the matter under the notice of the Meteorological Society, in an address delivered by him towards the close of last year, and noticed in the JOURNAL for Dec. 2 (p. 1155). He said that an examination of the historic records, or of the published mortality tables of this and other countries, showed that there are certain conditions which are found to be present when particular diseases are most rife. It is also found that, after eliminating special meteorological and other influences which are supposed to affect disease, some diseases appear to be solely influenced by the hygrometric condition of the ground, and the volume of water present in it. Ground water itself, except when polluted, does not exercise any influence as a cause of disease, but is merely the measure of the influences which are at work within a polluted soil, and of organic changes which take place there, and which lead to the development of a certain class of disease. The actual drying of the ground is a condition which is favourable to general health in this country; and this circumstance often masks in the death-rate the potential influence of certain diseases. The effect of the ground water is most marked in districts which draw their water supply from the ground, and amongst that section of the inhabitants who use such water for dietetic and other purposes, especially in the case of young children. The unhealthy time after the period of excessive low water, is that when the first rain begins to percolate through the soil, just as if it washed out into the water matters which had been specially prepared in the dark recesses of the earth, or drove out the ground air specially charged with the poison of disease. Particular epidemic outbreaks, which have become rife at a low-water period, can often be traced to definite rainfalls. Those quarters of the year when percolation has first commenced after low water are, without exception, the most unhealthy. There are a number of diseases usually most rife when the ground waters are low; but it is found that the deaths of children under five years of age fluctuate inversely in proportion to the volume of water in the ground. This is positive proof that ground water, at least, if not the direct cause, is the measure of the influences at work which seriously menace the lives of young persons.

The possibility of the contamination of water in mains subject to internal pressure was demonstrated in a paper read by Herr G. Oesten, of Berlin. The author said that, in laying mains containing water under pressure, but little fear was entertained as to the possible entrance into them of impurities from the surrounding soil, even should a leakage occur in the pipe; for it was generally believed that, under such circumstances, the water would always escape with a force proportionate to the pressure under which it existed in the pipe—thus effectually preventing the intrusion of any foreign matter. But such an intrusion of external matters might, and did sometimes, happen under the conditions of modern water supply. The conditions necessary to this result depended (as theory would indicate) upon the nature and direction of the aperture permitting the leakage and the rate of the flow of water within the pipe. If the direction of the leak were either perpendicular to, or

formed an oblique angle with, that of the current within the pipe, no foreign matter from outside could enter, whether the rate of flow within were rapid or slow. But if the leak took a direction forming an acute angle with that of the current within the main, the escape of water would diminish in proportion as the rapidity of the flow within the main increased; until, with a certain rapidity of current, there would arise, on the principle of the injector, a suction action, drawing external matter through the opening into the main, and carrying it along with the current. This had actually occurred in a house in Berlin. A medium position of the shut-off tap favoured the suction-action of an existing leakage. From this leak the water escaped, under definite conditions of pressure; but when a certain degree of rapidity of current was attained in the pipe, the suction action was set up, and sand was thus drawn into it. This sand would accumulate in the various secondary taps in the house, rendering them quite useless. It was while searching for the origin of the sand that the cause above described was discovered. It was therefore obvious that, under certain conditions, a leaky water-main, though containing water under pressure, might absorb impurities from surrounding soil, and convey them elsewhere with the current of water.

BRADFORD CORPORATION WATER SUPPLY.

Proposed Modification of the Nidd Scheme.

At the Meeting of the Bradford Town Council last Tuesday—the Mayor (Mr. E. W. Hammond) presiding—a recommendation of the Water Committee was under discussion by which they asked to be authorized to make an application to Parliament in the ensuing session for powers to modify their Act of 1890, so as to allow of the waters from the Nidd district being conveyed to Bradford at a higher level than provided for by that Act, in order to deliver the water by gravitation, instead of conveying it into the Heaton reservoir and pumping therefrom for the high-level service, and thus reduce the cost of the works, as well as save expense incident to pumping from the low level. It appears that the present Engineer (Mr. J. Watson) has come to the conclusion that it is desirable to deviate from the original scheme, as prepared by Mr. Binnie; and as this can be effected without any additional expenditure, Mr. Watson's proposals have met with the approval of the Committee. Mr. Watson's modification consists of an alteration of the level of the gathering conduit, so as to enable the water to be delivered to reservoirs at Bradford by gravitation. The change will to some extent reduce the area available as gathering-ground; but it will obviate the necessity of having to resort to the use of pumping-stations as a means of getting the water to the higher portions of the town, which was an essential part of the original scheme. For the purposes of his plan, Mr. Watson divides the Bradford district into three zones, each with its own district of supply. Under this method, the waters of Upper Barden, Lower Barden, and Chelker reservoirs would be used on the low-level zone; the water obtained from the Nidd Valley would serve for the middle zone; and the Thornton Moor and Stubden supplies would meet the needs of the high-level zone. Another advantage of the amended scheme would be that the distance to be traversed by the water would be reduced by about 7 miles; for Mr. Watson intends to tunnel through Rainstang, instead of going round Middlesmoor, and to make the tunnel through Greenhow Hill, at a higher altitude, which will have the effect of shortening it. His scheme provides for two service reservoirs to be made at Chellow Heights, each having a capacity for 30 million gallons, with filter-beds capable of dealing with 18 million gallons per day, and a clear-water basin for 2¼ million gallons. Another point in favour of Mr. Watson's scheme is that the new reservoirs would provide water for a district which is likely to increase in population. Arrangements are made for the scheme being carried out in instalments; and it is estimated that under this method there would be from the new works a supply of 9 million gallons a day in the year 1920, 13 millions in 1925, and 18 millions in 1930. It is intended to construct the tunnelling and conduit work for a flow of 20 million gallons per day; but where pipes are used, those laid down in the first instance will only be for a flow of 10 million gallons. Another change is to provide a masonry embankment for the Gowthwaite compensation reservoir, instead of earthwork. The embankment along its whole length will form a waste weir; and over it there will be a bridge to carry the roadway.

Moving the adoption of the Committee's recommendation, Alderman Holdsworth remarked that, if a good water supply could be obtained by gravitation—thus saving the expenditure of something like £60,000 in pumping plant, in addition to £7353 in working expenses—the question deserved the most serious consideration of the Council. The estimate had been very carefully made with respect to the price of labour and the quantities; and in dealing with the financial aspect of the question, he would only speak of a supply of 9 million gallons per day until 1920. The cost of the low-level scheme would be £747,926, in addition to that of pumping, which was equal to £11,000 per annum. This was for delivering the water into the Heaton reservoir. The estimated cost of the high-level scheme was £745,245, including the whole of the works, half of the filter-beds, and one of the storeage reservoirs at Chellow Heights. The working expenses of the low-level scheme would amount to £7353; and this was practically an expenditure in addition to the £747,926. By the low-level scheme the water, after it had been delivered into the Heaton reservoir, would have to be carried up to the Horton Bank Top reservoir, which would simply involve the construction of so much more length of conduit; and, therefore, it would be necessary to add to the estimated cost of the low-level scheme the expense of lifting the water up to Horton Bank Top. For the lifting of 9 million gallons of water, plant would have to be supplied at a cost of £60,000; and the interest upon the sinking fund at 6 per cent. would come to nearly £11,000 per annum. The pumping would therefore involve an expenditure for the 9 million gallons of more than £220,000; and thus, to properly distribute this quantity of water by the low-level scheme, would involve an expenditure over the cost of the high-level scheme which would yield in interest a sum sufficient to pay for any additional works—such as the construction of a reservoir higher up the valley, whenever required. He had no hesitation whatever in saying that the new scheme was quite as feasible as the original one. The resolution having been seconded by Alderman Smith Feather, Mr. Walker asked if, supposing the Committee appointed another Water Engineer, they would come forward with another scheme. The passing of the last scheme through Parliament cost the Corporation £10,000. Was this expenditure to be repeated? Mr. Lister thought the proposed expenditure on the new scheme might be deferred for some years if the conduit from the present Barden works were repaired and the leakages stopped. Alderman Edhouse said he understood that the new scheme would mean a saving of £10,000 a year to the town—a fact which should not be lost sight of. Alderman Hardaker complimented Mr. Watson on having improved the scheme in so short a time since his appointment a year ago. Alderman Smith Feather remarked that there would be no opposition to the altered scheme; and the cost of the new parliamentary powers would be merely nominal. Alderman Holdsworth, in replying upon the discussion, mentioned that they would lose 340 acres of gathering-ground by the new scheme; but this was not important. The resolution was carried unanimously.

The Lighting of the Promenade Concerts, Covent Garden, for the forthcoming season has again been entrusted by Sir Augustus Harris to the Wenham Company, Limited.

Gas Exhibition in Liverpool.—A series of lectures on gas cookery, by Mrs. Thwaites, in conjunction with an exhibition of gas appliances promoted by Messrs. Richmond and Co., Limited (formerly Unsworth and Richmond, Limited), of Warrington, has just been held in the Granby Hall, Liverpool, under the auspices of the Gas-Fittings Company, Limited, of Liverpool. The exhibition was regarded as so successful that one has been arranged to follow in another suburb of of the city—Blundell Sands.

The Gas Supply in the Salford Out-Districts.—From the minutes presented at the meeting of the Barton, Eccles, Winton, and Monton Local Board yesterday week, it appeared that several special meetings of the members had been held to consider the gas question. On the previous Friday, a special meeting decided that, in conjunction with the Swinton Board, a Bill should be promoted in the ensuing session of Parliament to empower the two Boards to make and supply gas. An understanding has been arrived at that Swinton shall supply Clifton, and Eccles the rest of the out-districts. Mr. Spary, in moving the adoption of the whole of the minutes with regard to the gas supply, said it would be gathered that there had been considerable discussion; and some difference of opinion had arisen which had not been anticipated in the earlier stages of the movement. These difficulties, however, had been overcome; and now the Board would be able to work with Swinton for the benefit of the two districts. Up to the time of obtaining the insertion of a clause in the Salford Act, Swinton and Eccles worked in perfect harmony. Subsequently a new difficulty had arisen with respect to the Swinton representatives, among a part of whom there seemed to be a feeling that Eccles wished to take advantage of them. On the part of the representatives of that Board, he wished to say that they had no desire to take advantage either of the Swinton representatives, the Board, or the ratepayers. The minutes were confirmed.

Bradford Corporation Electricity Supply.—At the monthly meeting of the Bradford Town Council last Tuesday, Alderman F. Priestman, the Chairman of the Gas and Electricity Supply Committee, moved the adoption of the minutes of that body, and made a statement as to the result of the working of the electricity department for the half year ended June last. He said that the total receipts during the six months amounted to £2093, including stock representing £109. The total expenditure, with the stock at the commencement (representing £110), amounted to £1261; leaving a balance towards what might be called gross profit of £832. For interest on loans, there had been paid £469 16s. 10d., and for sinking fund £392 16s. 8d.; making a loss on the half year of £30. A sum of £150 which had been received during the six months had been placed to capital account. If this had been put down to revenue, there would have been a profit of £120, in addition to interest and sinking fund. The losses on the department since it was commenced were as follows: First half year, £1079; second half year, £732; third half year, £315; and in the past half year, £30—making a total of £2157. The amount transferred to the sinking fund to date was £1942. He thought, although nothing had been taken off for depreciation, there was every prospect that, the next time the balance-sheet was presented, it would show a profit in addition to the payment for interest and sinking fund. Mr. Kay seconded the motion; and it was agreed to.

Electric Lighting for Sheffield.—The question of providing electric lighting for Sheffield was before the Town Council at their meeting last Wednesday. The Mayor (Mr. Alderman W. J. Clegg), in moving the adoption of the minutes of the Parliamentary Powers Committee, reminded the members that the subject of electric lighting had been before them for a number of years; and on one occasion they went so far as to promote a Provisional Order for obtaining power to supply electricity. When everybody else had been put out of the way, this application was, however, dropped, because it was thought that the knowledge of electric lighting had not proceeded far enough to enable the Council to take the matter up. Now that electricity had become the "light of the future," the question was whether the Council would take it into their own hands or give consent to a Company applying for an Order. In his opinion, they should allow some one outside to take the risk of making the application, provided satisfactory arrangements could be made with them. If these could not be made, the Committee recommended that the Council should themselves apply. If a Company obtained the Order, provision could be made as to the dividends they would receive; and at the end of forty years, the Council could take over the works, without paying for prospective value and so forth, as in the case of the water-works. The motion having been seconded, Mr. Styring moved, as an amendment, that the matter be referred back to the Committee with instructions to take the necessary steps to obtain a Provisional Order. He argued that the Council must either take up the work or stand out of the way; and that it would be a great mistake to let another Company have a monopoly. Mr. Eaton seconded the amendment. A long discussion ensued, at the close of which the amendment was defeated, and the motion carried.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

The Municipality of Edinburgh are in bad favour just now on account of a prospective increase of the assessments. At a Town Council meeting on Tuesday, Treasurer Clapperton, in explaining how the increase had become necessary, said, with reference to a prospective rise in the estimated cost of public lighting from an actual expenditure of £15,602 to £19,050, that this was "an alarming increase; but he supposed they had to thank the Gas Commissioners for it." Following up this, Mr. M'Crae said "it was interesting to know that when the lighting of the city was under the Gas Company—in the year 1887-88 for example—it cost £7500 for gas lighting when the rate was 3s. 3d. per 1000 cubic feet. Two years later, under the Gas Commission, the rate to the city was 2s. 6d. per 1000 cubic feet, and although that was 9d. per 1000 cubic feet cheaper than in 1887-88, they were paying £200 a year more for lighting. The greatest contrast came out when the current year was compared with 1888. The expenditure for the current (last?) year was estimated at £11,400—an increase of £4000—and meant that the citizens were not only paying more for household gas, but were paying an extra ½d. per £1 on the taxation for the lighting of the city? Bailie Steel, who is Convener of the Cleaning and Lighting Committee, explained that "the fact of their estimate being £3398 over last year's expenditure was almost wholly represented by the sum of £500 for the electric light, and of an increased sum of £2667 for gas. When the gas was reduced in price, they put a larger burner into their public lamps; and the only way now to cut down the expenditure on that score would be to go back to the old burner. The extension of the city accounted for most of the remainder of the increase under the head of lighting." Neither of the speakers gave the true explanation of the increase, which is simply that the Edinburgh Gas Company in its day was exceedingly generous to the Corporation in the matter of public lighting, and supplied a much greater quantity of gas than they charged for. The Gas Commissioners charge for every foot of gas consumed. When, after the transfer, the Corporation endeavoured to make their consumption square with their estimated outlay, there was an outcry that the streets were not so well lighted. The Corporation stifled the complaints by fitting larger burners to the lamps; and when gas was cheap, the increased consumption was not felt. Now, however, when the price of gas has been raised, the community which called for the light must pay for it. For the altered situation, therefore, notwithstanding Treasurer Clapperton's remarks, there is no blame attachable to the Gas Commissioners.

The Dunfermline Gaslight Company is constituted as a co-partnery; a specified number of years being agreed upon in which it is to run. One of these periods expires on Nov. 11 next; and the partners met the other day to consider what they are to do after that date. Of course, such a meeting was necessarily held in private; and very little information is obtainable as to what transpired at it. The result is almost all that is known; and that is that it was resolved to convert the undertaking into a limited liability company, and that a committee was appointed to arrange as to the capital. It is understood that the present £17 10s. shares are to be counted as £25, recent sales of shares having realized £27 to £28. The committee was also empowered to consider the question of removing the works from their present site in the town to Grange Road, in the suburbs, where the Company possess an admirable site and have already constructed their gas-holders. The question of the Corporation acquiring the Company's undertaking was discussed for about two years; but it was shelved last May on account of a little stiff-neckedness on the part of both parties—the Company requiring the Town Council to name a price, and the Council declining to do any such thing until after a conference with the Directors of the Company. I am afraid the Corporation will now find that they have lost an opportunity; because, with the extended capital of the Company, the price to be paid, if they should go into the matter again, will be larger. I suspect, however, that nothing more will be seriously attempted until after the removal of the works.

It is perhaps a trifle ungenerous to criticize severely the remarks of a Chairman engaged in persuading the shareholders of a Company to adopt the annual report of the Directors; but the Chairman of the St. Andrew's Gas Company travelled so manifestly out of bounds, that it is necessary to pull him up a little. The Company, it is a pleasure to see, had a very prosperous year. Their output was larger than that of the previous twelve months by nearly 2 million cubic feet—being the largest they ever had; and their income, which was £5013, was higher by £654. So satisfactory is the position of the Company, that it is possible to go on for another year without raising the price of gas from 3s. 9d. per 1000 cubic feet; the shareholders rather preferring to run the risk of a lower dividend next year. The Company have paid off £200 of debt during the past year, reducing it to £300. Their balance after all this was £1526, out of which the customary dividend of £2 10s. per share was paid. All this should have been quite sufficient reason for the adoption of the report; and there was consequently no excuse for the Chairman wandering into the elaborate comparisons with other places which he gave. In these comparisons Edinburgh was made to figure very undesirably. "Some years ago," the Chairman said, "there was a proposal to buy the gas-works in St. Andrews. Edinburgh was held out as a place where the ratepayers had derived immense advantage by the purchase of the gas undertaking. The result was that the price of gas had steadily increased since it had got into the hands of the Edinburgh Corporation; and at the present moment it was exactly 9d. per 1000 feet more than was charged in St. Andrews." I need scarcely say there are many things to account for this state of matters, not the least of which is that in St. Andrews the Gas Company has been in existence 56 years, whereas in Edinburgh the Gas Commission is only in its fourth year. Your readers will understand what that means. Although I have frequently express disapproval of the conduct of individual members of the Edinburgh Gas Commission, and taken exception to the method in which business is sometimes conducted, I have never accused the Commissioners, and do not believe the accusation would be just, of having mismanaged the undertaking. On the contrary, I am convinced that the Edinburgh Gas Commissioners have managed their undertaking with marked ability, considering that they were new to the work; and I do not relish the idea of the gentlemen at the head of the St. Andrews Gas Company "swelling" himself till he thinks he can measure himself with Edinburgh. I detract nothing from the St. Andrews Gas Company. A Company which is able to pay a 25 per cent. dividend must be excellently managed. On the other hand, its opportunities are such as few other towns have experienced. St. Andrews is a stationary town, and has required few extensions. The nominal capital of the Gas Company is only £3950, which is very different from the £450,000 odd which have been required in Edinburgh and Leith to construct and keep the gas-works and plant up to the requirements of rapidly growing communities. This is sufficient in itself to account for the difference in the position of the two gas undertakings; I trust that when next the Chairman of the St. Andrews Gas Company addresses the shareholders, he will confine himself to the business of his own Company, and not throw stones at his neighbours.

In the Aberdeen Town Council on Monday there was a good deal of what can only be called squabbling over gas matters, little, however, of which tended to edification. The only item of importance was that in which Bailie M'Kenzie, the Convener of the Gas Committee, when questioned regarding the low quality of the gas supplied, repeated the explanation he formerly gave—that it was owing to contracts for inferior coal having been entered into before he was appointed to the office; and he replied, when asked as to the time when this coal would be all consumed, that he could not say it would be before November.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

The fixing of the property valuations throughout Scotland, for assessment purposes, is now in progress for another year. Two cases that have come within my notice during the past two or three days are those of the works of the Stirling Gaslight Company and of the Corporation of Dumbarton. A Stirling paper of to-day says that the valuation of the burgh has increased since last year by £1000 in round figures, which is regarded as very gratifying; but the writer says it is certain that in some instances the estimates of the Assessor will be challenged. He further remarks that the Gas Company have had their valuation increased by some £400, to which they are not likely to submit without a fight; but he adds that most people will look upon the increase of the valuation as a fitting retribution for the rise in the price of gas. The information to hand from Dumbarton on the question of property valuation is to the effect that the Assessor for the burgh proposes has put on a very large addition to the valuation of the Corporation Gas-Works. It is said that the increase will be fully £1000.

On Wednesday evening the Finance Committee of the Burgh of Gourock had under consideration certain proposals as to reductions in the rates of local assessment; and their recommendations were brought before the Burgh Commissioners, sitting in Committee, last night. Two of the recommendations were that the price of gas should be reduced 2d. per 1000 cubic feet, and that meter-rents should be wholly abolished. These were both approved of. There was likewise a proposal to increase the salary of Mr. M'Ewen the Gas Manager; but the recommendation was rejected. It is just possible that it may again be brought forward when the Commissioners have their next monthly meeting, which will not be held *in camera*. The Gourock Police Commissioners, or a majority of them, seem to regard the possibility of the balance being on the wrong side at the close of the financial year of the gas supply undertaking.

When announcing lately that Mr. G. R. Love, the Assistant-Manager of the Paisley Corporation Gas-Works, had been a candidate for the vacancy in the managership of the Kirkcudbright Corporation Gas-Works, and that another gentleman had been the choice of the Gas Commissioners, I little thought that I should so soon have the pleasure of stating that he had met with better fortune from a town in Ireland. Well, I may now state that he has been appointed Manager of the Dundalk Gas-Works, at a salary of £150 a year. The best wishes of his many friends will go with Mr. Love to his new scene of usefulness. I may here also mention other two appointments. Mr. Thomas Callander, late of the Old Kilpatrick Gas-Works, will in a few days enter upon the duties of the managership of the gas-works at Kilmaurs, near Kilmarnock. The other appointment is that of Mr. William Wright, Gas Manager at Dreghorn (also near Kilmarnock), who will succeed Mr. Smith at the West Kilbride Gas-Works.

In last week's "Notes" I referred to a case of some interest which had been raised in the Glasgow Small Debt Court at the instance of Mrs. Margaret Frame against the Glasgow Corporation Gas Commissioners, for £10 as damages sustained by her through (1) the refusal of the Corporation to allow interest upon the money deposit offered by her on April 9 last in security for payment of the gas to be supplied to her premises at No. 182, West Graham Street; and (2) the failure of the Corporation to supply gas to these premises, upon an offer of security being made by her from the said date till June 3, 1891. Sheriff Birnie has now given his decision in the case. He has assoilzied defenders; and in giving his judgment, his Lordship said that by the Gas Commissioners' Act they were bound to supply gas, but were entitled to demand reasonable security. In this case they demanded £3. His Lordship thought it proved that the pursuer offered to consign the £3 if the Gas Commissioners guaranteed her bank interest. In his Lordship's view, it was unnecessary to consider if the Gas Commissioners were bound to pay interest made by them, less expenses. It seemed to him that the pursuer was not entitled to lay any obligation on them to put the money out at interest, which meant risk to themselves; and that her duty was to consign the £3, leaving her action for the interest, should such interest be earned and due to her. This matter has been much talked about since the decision was given, more especially by those gas consumers who had deposited money with the Gas Commissioners in security of the payment of their gas accounts as they become due. Of course, the question may yet come up again in some other form; for it is evident that Mrs. Frame has a somewhat litigious and combative spirit. A local paper says that the decision settles one of the two points involved in the gas-deposits question, but leaves the

other untouched. The Sheriff has decided that the obligation on the part of the Gas Commissioners to supply gas does not exist unless they have been furnished with reasonable security that the gas supplied shall be paid for by the consumer. He has not decided the question whether the Gas Commissioners are bound to pay interest on deposits, in the event of their investing them or lodging them in the bank. The deposits in the aggregate amount, he says, to a good round sum; and the grievance has often been expressed that such a large sum should bring no return to its owners

It is reported that the trade in gas-making oils is somewhat flat, but stocks are moving more freely than was the case some time ago. Sulphate of ammonia has of late been rather dull, both for prompt and for forward delivery; but it is again showing signs of firmness. The future course of the trade in sulphate will largely depend on the action of the new Government of Chili in regard to the working and shipment of nitrate of soda.

The business in Scotch pig-iron warrants has been steady this week; and the fluctuations in price have been between 47s. 6d. per ton on Monday and 47s. 3d. on Wednesday; the close yesterday afternoon being buyers at 47s. 5d. cash. More business has been done in Cleveland and hematite warrants, both of which have been very strong. Prices for the former have advanced from 39s. 10½d. to 40s. 10½d. per ton cash, and for the latter from 49s. 9d. to 50s. 6d. per ton cash; yesterday's closing quotations for buyers being respectively 40s. 10½d. to 50s. 6d. cash. This week there has been a great amount of buying by consumers all round; and within the past few days there has been a considerable deal of speculative buying of hematite and Cleveland iron, alike on the part of those dealers who were oversold and those who are now going for investments in the hope of higher prices. There has also been rather more demand for the different brands of Scotch makers' iron, the prices of which are a shade higher all round.

The Scotch coal trade continues uncommonly firm. All the large collieries have good contracts in hand, some it is said, being well booked for six months ahead. The demand is still mainly on export account; and this appears largely due to the low state of the freight market. Canadian ports, which for years have not been able to pay the prices here current for coal owing to the freights asked, are now opening up on account of vessels taking exceptionally little money for carriage. Other places are in the same position; and the inquiry for these new markets is making sellers here very independent. Home requirements are only moderate. Grave complaints are still heard as to the scarcity of waggons, which is considerably hampering work at several of the collieries.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 12.

Sulphate of Ammonia.—There is a better feeling all round; and a good demand is springing up from various quarters. Prices have so far not shown any development; but £10 15s. may be taken as the lowest price of the day at the various ports. The firmer tendency is probably due, in a great measure, to the strong market, and further advance in nitrate, which reduces the difference between the values of the two commodities still more; making sulphate by a long way the cheaper nitrogenous material. There is very little spot sulphate offering; and although there is again a good inquiry for forward contracts, business is impracticable, because those makers who are willing to sell are advancing prices. Nitrate is firm on spot at 9s. 1½d. per cwt.

LONDON, *Sept.* 12.

Tar Products.—Pitch keeps in good demand; and the price, though a shade lower, has not deterred makers so far selling. It is commonly reported that pitch producers are largely sold. It was generally thought that, with the lower price of coal, pitch would, as in former years, go lower in sympathy. The consumption, however, appears to have increased; and undoubtedly the area of consumption has also largely extended. But whether the North French and Belgian makers can afford to pay to-day's prices is uncertain; while, for American and German account, the question of price does not appear to be an element in the calculation. Benzols are flat; and the same remark unfortunately applies to most of the other products, with perhaps the exception of solvent naphtha, which looks as if it had touched bottom, and is now selling more freely at a better price. Business is reported at the following prices: Tar, 24s. to 26s. 9d. Pitch, 32s. 6d. to 34s. Benzol, 90's, 4s.; 50's, 3s. Toluol, 1s. 5½d. Solvent naphtha, 1s. 5d. Crude naphtha, 1s. 2½d. Creosote, 1⅜d. Carbolic crystals, 5d. to 6¼d.; crude 60's, 1s. 3d. Cresol, 8d. Anthracene, "A" quality, 1s. 3d.; "B" quality, 11d.

Sulphate of Ammonia.—Makers appear very indifferent about selling; and little business has, in consequence, been transacted during the week. Sales are mentioned at from £10 11s. 9d. to £10 15s. less 3½ per cent., having regard to position and conditions of delivery. Gas liquor is quoted at 4s. 6d. to 5s. 6d.

Halifax and the Water Supply of Morley.—The Water Committee of the Halifax Town Council reported at the last meeting of that body that they have agreed to supply water to the Morley Corporation at 6d. per 1000 gallons; the latter to pay interest at the rate of 6 per cent. on the purchase cost of the meters and on the expenditure for the meter-house. The agreement is for five years, subject to the Morley Water-Works being available before the end of that period, in which case the agreement is to be determined.

Cullingworth Gas Company, Limited.—This Company was registered on the 1st inst., with a capital of £10,000, in £5 shares. The objects are: To acquire and carry on the gas-works at Cullingworth, Yorks, now belonging to the Hallas Gas Company, Limited; to carry on at Cullingworth and elsewhere in Yorkshire the business of an electric light company, including that of electricians, mechanical engineers, suppliers of electricity for light, heat, motive power, or otherwise, and manufacturers of and dealers in all apparatus required for the generation, distribution, supply, accumulation, and employment of electricity.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

Except that the recent change in the weather has tended somewhat to check business in house fire qualities, there is no material alteration to report with regard to the coal trade of this district. A temporary relaxation in the demand for house fire coals will not be at all unwelcome to colliery proprietors, as it will enable them to put something down into stock, which generally is much below the average for the time of the year. As to prices, they continue exceedingly firm, with a tendency to level up to last winter's rates where concessions have been made during the summer months; and at the pit mouth, the minimum quotations are 12s. to 12s. 6d. for best Wigan Arley, 10s. 6d. to 11s. for second qualities of Arley, 10s. to 10s. 6d. for Pemberton 4-feet coals, and 9s. to 9s. 6d. for common house fire coals, with the maximum rates becoming gradually more nearly the average selling price. In other descriptions of fuel, the demands continue only moderate, with ample supplies so far as round coals for steam and forge purposes are concerned, and largely in excess of requirements as regards the lower descriptions of engine fuel. Common round coals maintain about late rates; but there is still some want of firmness in the market, and ordinary descriptions can be readily bought at about 7s. 6d. to 8s., although 8s. 3d. is quoted for some of the better qualities at the pit mouth. There is no further quotable change in engine fuel beyond what was referred to in my last report, but a weak and irregular tone prevails throughout the market; and even with the resumption of requirements in outside districts, where works and mills have recently been stopped more or less generally for the holidays for periods extending to pretty nearly a week, there is no present indication of any improvement in the market. At the pit mouth, burgy does not average more than 6s. 6d. to 7s.; best slack, 5s. 6d. to 6s.; with common sorts obtainable at from 3s. up to 4s. per ton. For shipment there is a moderate demand, with steam coal averaging from 9s. 3d. to 10s.; and good house fire coals, 12s. to 12s. 6d. per ton, delivered at the ports on the Mersey.

Northern Coal Trade.—During the past few days, there has been a slightly easier tone in some branches of the northern coal trade. Best Northumbrian steam coal has been sold in one or two instances at a rather lower price. But this has mainly been because of the want of ready steamers; and generally about 12s. 6d. per ton, free on board, is still the current price. Second-class steam and small steam are easier, there being a very large production, with a little falling off in the demand; but it is expected that there will be an improvement soon, as in autumn buyers begin to enlarge their needs, and to lay in stocks. Gas coals are steady; some of the collieries being well kept at work by the large contracts they have taken, whilst other contracts are beginning. The general price for odd cargoes of coal varies for best Durham gas coal from 9s. 6d. to 10s.; but the contracts running to the end of the current year are, in some instances, at higher rates. Those for next year are known to show a reduction; but on the whole the coal trade of Durham has a number of very profitable contracts. Coke seems rather steadier; there having been heavy sales of best blast-furnace coke for export at from 15s. 6d. to 16s. free on board. There is no alteration in gas coke yet; but it is expected that the price will be lower for next year's contracts.

An Electric Lighting Project for Morecambe.—The prospectus of the Morecambe Electric Light and Power Company, Limited, has been issued. The Company has been formed, with a capital of £15,000, in £1 shares, to supply electric light and motive power in the above-named Lancashire seaside resort. It seems that one of their main objects is the public lighting; and in this project the Local Board have acquiesced. With regard to the general supply, the Company propose to commence operations in the more central portion of the town. Although this is an attack on the Gas Company's position, it is a question if it will interfere very much with the further development of their business, the growth of which, as mentioned by the Chairman at the meeting reported in the JOURNAL last week, has necessitated an increase in the manufacturing plant, which will have to be undertaken without delay.

Lurgan Water Supply.—After a great deal of preliminary investigation and discussion, the Town Commissioners of Lurgan have at length been enabled to take what may be regarded as the first practical step in connection with the carrying out of a scheme for providing the town with a water supply that shall be fully equal to the commercial, as well as the domestic, requirements of the inhabitants. The waters of Lough Neagh have been chosen as the source of supply, which will be taken from a point distant about two miles from Lurgan. The supply will be an inexhaustible one; while as regards the quality of the water, Dr. C. Meymott Tidy has pronounced it to be in every respect suited for domestic use. It is intended to erect two reservoirs—one capable of holding 400,000 gallons of water or thereabouts, and the other of containing 100,000 gallons or upwards.

Proposed Extension of the Colchester Water Supply Plant.—At the meeting of the Colchester Town Council last Wednesday week, the Water Committee reported that they were of opinion there was a proved necessity for an extension of the machinery and works for maintaining the water supply of the town; and they unanimously recommended the Council to adopt a report made by Mr. J. M. Wood, C.E., and to empower them to execute such portions of the scheme contemplated by it as they should deem expedient. They also desired to be authorized to engage Mr. Wood as their engineer in carrying out the project should they find it advisable to do so. Mr. Paxman, as Chairman of the Committee, in moving that the report be adopted, said that, in order to carry out the proposed work, they would want to borrow about £10,000. This could be had at 3½ per cent. yearly, which would cost £350 per annum. Then there would be a sinking fund establis hed, which would require £150, making £500 a year. After a short discussion, the matter was adjourned, pending the issue of a second report by Mr. Wood.

The Price of Gas at Goole.—One of the Directors of the Goole and District Gas and Water Company (Mr. G. Claybourn) has resigned his seat on the Board as a protest against the policy of the Directors in persistently refusing to reduce the price of gas (which is now 4s. 3d. per 1000 cubic feet) in the face of the recommendation of the Goole Local Board, who own one-third of the capital of the Company, that such a step should be taken.

The Newport (Mon.) Gas Company's Garden Allotments.—On Friday, the 4th inst., the money prizes awarded by the Directors of the above Company to the workmen who are holders of garden allotments on their property were distributed. The Chairman of the Company (Mr. E. J. Phillips) presided; the Engineer and Manager (Mr. Thomas Canning) being present. The Chairman, in addressing the men upon the excellent report made by the judge (Mr. Wattie), who had experienced great difficulty in awarding the prizes, the gardens being all in such good condition, said that this year the Directors had great pleasure in awarding further prizes for the new allotments, similar to those offered for the old. The prevailing idea was that the manufacture of gas was injurious to both vegetable and flower growing; but the appearance of the gardens altogether disproved such a statement. They were in a much finer condition than his own; and in his travels he had not seen such gardens anywhere—in fact, they were a credit any working man in the kingdom. It gave himself and his colleagues great pleasure to attend and distribute the prizes to those who had worked hard and won them; and he was pleased to note a marked improvement upon last year's show. The prizes (ranging from 5s. to 10s.) were then distributed to the respective winners.

An Electric Lighting Scheme for Launceston (Tasmania).—The Launceston City Council at a recent meeting adopted a report of the Public Works Committee under which a scheme for supplying the city with electricity for public and private lighting and for motive power is to be projected, at an estimated cost of £50,000. The idea is to utilize the water of the South Esk for the generation of the necessary power. The water will be conveyed in pipes to a place where the available head will be 250 feet, giving about 850-horse power; but by duplicating the pipe-line, it is expected that this can be increased to 1700-horse power. This work is estimated to cost £21,000; and it will, of course, be the first portion of the scheme to be proceeded with. Remarking on the action of the Council, a writer in a local paper said: "We are told that, in round numbers, the total cost will be £50,000. This means a charge for interest and contribution to the sinking fund, estimated at 5 per cent., of some £2500 per year. The working expenses, including contingencies, are set down at £3500 more; making a total of £6000 per annum as the total amount that will have to be provided in order to replace gas with electricity. For this sum it is estimated that 850-horse power can be obtained, which will be available for motive power for machinery by day and lighting power by night. Then comes the question of how this £6000 is to be raised, and the proper mode of raising it. The cost of street lighting at present amounts in round numbers to £1500 per year, for which about 270 gas-lamps are provided. The cost of lighting such other buildings as the Town Hall, Albert Hall, police station, and other places for which the Council are responsible, is to be added to this sum, and also the saving by utilizing electric instead of steam power at the Corporation quarries, which will bring the amount on the credit side up to, in round numbers, £2000 per annum, leaving about £4000 to be provided by taxation, or else a direct charge on those who decide to have the power laid on to their premises."

Electric Lighting for Portsmouth.—A report has been presented to the Portsmouth Town Council by the Electric Lighting Committee on a scheme for the private and public lighting of the borough by electricity. It appears therefrom that they obtained from Mr. J. N. Shoolbred, C.E., a preliminary report. In this he discusses the merits and demerits of the rival systems of supplying electricity for private purposes, and then suggests the use of continuous currents at low pressure, supplemented by the use of storeage batteries, and distributed on the three-wire system. The capacity of the installation which he recommends to be laid down at first would be of a maximum output of 5000 lights, each of 16-candle power, burning at one time. The buildings at the generating station would, however, be constructed large enough to contain, without addition, generating plant for about double this output. As to the cost of the system, Mr. Shoolbred puts the capital expenditure at £45,000, made up as follows: Buildings, £4000; generating plant, £12,500; mains and house services, £18,000; storeage batteries, £3800; pipework and sundries, £2600; and expenses and contingencies, £4100. The annual expenses are estimated at £8939, including £1575 as interest at 3½ per cent. on the borrowed capital of £45,000, and £905 towards the repayment of that capital in thirty years. Estimating the revenue at £10,390, Mr. Shoolbred shows that these figures will result in a profit of £1451 on the year's working. Mr. Shoolbred then points out that in public lighting the conditions of demand are quite different, varying only according to the season of the year, as to the length of time during which lighting is wanted. The system of public lighting which he proceeds to expound is accordingly kept apart from the private lighting system, both as regards the generating plant and the method of distribution outside, although the former is to be placed in the same central station with the plant provided for the private lighting, and under the direction of the same staff. His estimate for public lighting, in which illumination by arc lamps is alone allowed for, is as follows: Cost of 25 lights on the Clarence Esplanade, 25 on the South Parade, with engines, dynamos, boilers, cables, lamps and posts, &c., £5500; 40 arc lights at refuges and other prominent points in streets named in the Electric Lighting Order, with engines, dynamos, &c., £5000; contingencies, 10 per cent., £1050—making a total of £11,550. The Electric Lighting Committee are of opinion that this scheme is the best that could be adopted. They point out that, in Mr. Shoolbred's report, the total cost of the installations for public and private lighting is estimated at £56,550; but to this, they say, should be added a sum for acquiring a site and meeting other expenses. The Committee recommend that the report be adopted, and that application be made to the Local Government Board for sanction to borrow £60,000 for the purpose of providing electric lighting for the borough.

East London Water-Works Company.—The Directors of this Company have resolved to recommend, at the general meeting to be held on the 6th prox., the payment of the same rate of dividend as before—viz., 8 per cent. per annum, less income-tax, carrying forward £9371.

New Joint-Stock Companies Registered.—The Brownhills Chemical Works, Limited, with a capital of £5000, in £5 shares, is to acquire the Brownhills Chemical Works, Limited, and to carry on the business of chemical manufacturers.——Rose's Patents Company, Limited, with a capital of £10,000, in £1 shares, is to carry into effect an agreement with Messrs. Rose and Co., lighting and heating engineers, of Glasgow, and with Archibald Baird and Matthew Barr Baird, manufacturers of steel castings, Glasgow, for the sale to the Company of certain patent rights for inventions by George Rose, to carry on the business of engineers or engineers' furnishers, in the United Kingdom or elsewhere, and particularly to conduct the business with a view to improving and developing lamps, furnaces, steam generators, apparatus for the manufacture of water gas, and other mechanical apparatus and processes.

Annual Accounts of the Keighley Corporation Gas Department.—The report of the Gas Manager (Mr. J. Laycock) for the year ending June 30 was submitted at the meeting of the Keighley Town Council last Tuesday. It showed that the net profits amounted to £5532, which it had been decided to appropriate as follows: To the sinking fund account, £1294; to the reserve fund account, £1238; and to the water department, £3000. The receipts from the sale of gas amounted to £21,472, being a decrease of £182 as compared with the previous year; but there would probably have been a considerable increase if some new retort-stacks had been completed in October instead of January, as in the interval it was impossible to supply the demand. The income from coke had been £5657, equal to 5s. 7·2d. per ton of coal used, as against £4558 and 4s. 6·9d. per ton of coal in previous years—the increase compensating somewhat for the extra cost of coal. On the expenditure side, the item of wages had again risen on account of increased pay and the lessening of the hours. This increase during the past year was £1000 more than two years ago.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 479.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	,,	7½	Do. 7 p.c.	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	28 May	8	Bahia, Limited	20	13—15	..	10 13 4
200,000	5	13 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	218-223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	157-162	..	5 14 2
220,000	20	12 Mar.	11½	Brighton & Hove Original	20	41—43	..	5 6 11
320,000	20	10 Apl.	11½	British	20	45—47	+1	4 15 9
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18—20*	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13—15*	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	7—8	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	90—95	..	6 6 4
150,000	20	13 Aug.	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	10 Apl.	13¾	Commercial, Old Stock	100	255—265	..	5 3 9
130,000	,,	,,	10¾	Do. New do.	100	190—200	..	5 7 6
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	230—240	+2½	4 3 4
200,000	,,	,,	7	Do. 7 p. c. Pref	100	190—200	..	3 10 0
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	200—205	..	4 17 7
486,090	10	15 July	10	European, Limited	10	20—21	..	4 15 3
354,060	10	,,	10	Do. Partly paid	7½	14¼—15¼	..	4 16 9
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	229—234	—1	5 11 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	254—259	..	3 17 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118—123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172—177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	159—164	..	4 5 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	153—158	..	3 16 0
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120—125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	231—236	..	5 1 9
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¼—4¾	..	6 6 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	111—113	..	4 8 6
541,920	20	11 June	6½	Monte Video, Limited.	20	16—17	..	7 12 11
150,000	5	28 May.	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	25 Mar.	7	Ottoman, Limited	5	4¾—5¼	..	6 7 3
166,870	10	26 Feb.	2	Pará Limited.	10	2¾—3¼	..	—
				People's Gas of Chicago—				
420,000	100	4 May	6	1st Mtg. Bds.	100	92—97	..	6 3 9
500,000	100	1 June	16	2nd Do.	100	90—95	..	6 6 4
150,000	10	28 Apl.	10	San Paulo, Limited	10	13—15	..	6 13 4
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	278-283*	..	5 9 6
1,550,000	,,	,,	12	Do. B do.	100	230-235*	..	5 2 1
200,000	,,	,,	13	Do. C do.	100	240-245*	..	5 6 1
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	141—145	..	3 9 0
60,000	5	12 Mar.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	262—267	+1	3 14 11
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	209—214	..	3 14 9
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138—143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	107—112	..	3 11 5
708,000	Stck.	13 Aug.	10½	Kent	100	265—275	..	3 16 4
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	235—240	..	3 19 2
406,200	100	,,	7½	Do. 7½ p. c. max.	100	193—198	..	3 15 9
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—123	..	3 5 0
500,000	100	13 Aug.	12½	New River, New Shares	100	341—346	..	3 10 1
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123—126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	165—170	+1	3 16 5
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160—165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex	100	253—258	+1	3 17 6

*Ex div

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO., TELEPHONE No. 2698.

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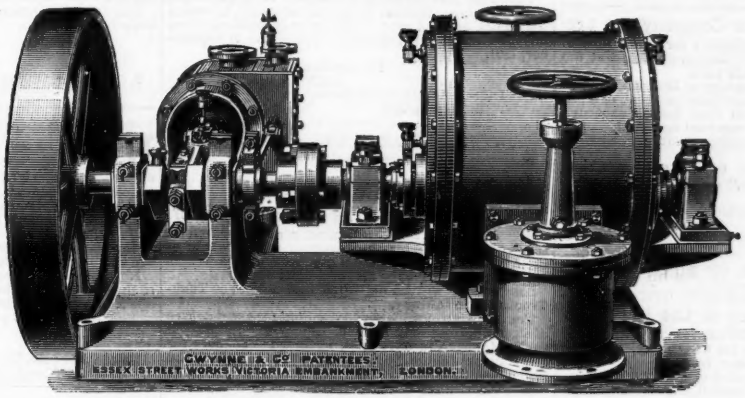
Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



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GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

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Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

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NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
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JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

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Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
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Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

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ADVERTISER (age 23) seeks position as CLERK and COLLECTOR with a Gas Company. Nearly Four years in present situation. Thoroughly competent, and good worker. Would undertake general office work, collecting, timekeeping, tracing, measuring up work and materials, &c.
Address, B., 44, Cornmarket, OXFORD.

WANTED, a respectable, sober, married man as STOKER. Must be well acquainted with the working of an Engine and Exhauster. Wages, 32s. per week with Bonus. Sunday holiday once a month, and a week's holiday in the Summer, with pay.
Apply, stating age, &c., to the Gas-Works, DORKING.

WANTED, a Working Foreman for Tar and Chemical Works in Yorkshire. Must be well up in Tar Distilling, and thoroughly competent to have charge of men. Only steady, active, and industrious men need apply, stating age, capabilities, present occupation, with references and wages required.
Address C. 119, *The Yorkshire Post*, LEEDS.

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*** See Advertisement p. 512 of this week's issue.
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(GAS DEPARTMENT.)

WANTED, a Main and Service Layer.
One able to fix Meters and do rough fitting work, and accustomed to Gas-Works preferred.
Apply, stating age and giving references, to
JOS. TIMMINS, Engineer.
Wigan, Sept. 11, 1891.

DALTON-IN-FURNESS.

THE Committee of Management of the Dalton Gas-Works invite TENDERS for an EXHAUSTER, to pass 5000 cubic feet per hour; also for one to pass 3000 cubic feet per hour. Also a 1-horse power GAS-ENGINE, with PUMP, &c.
Further particulars may be obtained on application to Mr. Jones, the Gas Manager.
Tenders, sealed and endorsed "Exhauster," and addressed to the undersigned, will be received up till Thursday, the 17th of September.
The lowest or any tender not necessarily accepted.
FRANCIS H. CLARK, Secretary.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
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OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
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Head Office: MIDDLESBROUGH. Correspondence invited.

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LUX's new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

MANCHESTER CORPORATION GAS-WORKS.

MANAGER.

THE Gas Committee are prepared to receive APPLICATIONS for the appointment of a MANAGER for their Rochdale Road Gas Station.
The successful candidate will be required to devote the whole of his time to the duties of his office.
Applications, stating age and experience and salary required, and enclosing copies of recent testimonials, to be forwarded to the Office of the Superintendent of the Gas Department, on or before the 18th of September next, addressed to the Chairman of the Gas Committee, and endorsed "Application for Appointment of Station Manager."
Canvassing will disqualify.
By order,
WM. HENRY TALBOT, Town Clerk.
Town Hall, Manchester,
Aug. 28, 1891.

OFFERS Wanted for Numbers of the JOURNAL OF GAS LIGHTING from 1850 to 1888, almost complete, some bound; also for bound "Reports of Proceedings of the British Association of Gas Managers," eleven years.

Full particulars on application to Mr. GEORGE GOLDSMITH, 19, Oxford Street, LEICESTER.

THE Stretford Gas Company are prepared to receive TENDERS for the supply of about 125 tons of OXIDE OF IRON, delivered at the Gas-Works, Stretford, carriage paid.

Tenders to state the percentage of Iron each ton of Oxide contains, and also the quantity per cent. of moisture contained therein, which shall not be exceeded in each and every ton of the material delivered.

Tenders are also invited for about 180 tons of SPENT OXIDE.

Tenders to be addressed to the Chairman, and endorsed "Tender for Oxide," on or before Monday, Oct. 12, 1891.

No tender necessarily accepted.

BENJAMIN HAYNES,
Secretary.

CORPORATION OF BURY.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Bury Corporation invite TENDERS for TAR for Nine months commencing on the 1st of October, 1891, and terminating on the 30th of June, 1892.

Particulars and form of tender may be obtained on application to Mr. W. H. S. Gendall, Gas-Works, Elton, Bury.

Sealed tenders, endorsed "Tender for Tar," to be sent to me the undersigned on or before Tuesday, the 22nd inst.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
September, 1891.

BRISTOL GAS COMPANY.

TENDERS FOR COKE.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of their surplus make of COKE during the Twelve months ending the 31st of December, 1892.

Particulars and Specifications, with Form of Tender, may be obtained on application to the undersigned, to whom also tenders, sealed and endorsed "Tender for Coke," must be delivered not later than Ten a.m., on Monday, the 9th day of November next.

The Directors do not bind themselves to accept the highest or any tender.

JAS. V. GREEN,
Secretary.

Chief Offices: Canon's Marsh, Bristol,
Aug. 26, 1891.

TENDERS FOR TAR.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the surplus TAR they will have for disposal during the Twelve months ending Sept. 30, 1892—namely, about 1800 tons, to be divided into Three contracts of 600 tons each.

The Company will probably dispose of the total surplus of approximately 1800 tons in One, Two, or Three contracts as the Board may decide; but they do not bind themselves to accept the highest or other tender or tenders.

Tenders must be addressed to the Chairman of the Finance Committee of the Derby Gaslight and Coke Company, Friar Gate, Derby, endorsed "Tender for Tar," and delivered on or before Tuesday, the 29th day of September, 1891.

Further particulars may be had on application.

By order of the Directors,
RICHARD FISHER,
Secretary.

Derby Gas Office,
Sept. 5, 1891.

TO GASHOLDER MAKERS.

THE Directors of the Ashton Gas Company invite TENDERS for the construction and erection of a TELESCOPIC GASHOLDER, 140 feet diameter and 30 feet deep, with the necessary Columns and Girders complete.

Drawings may be seen, and copies of specification obtained, on application to the undersigned, to whom sealed tenders, endorsed "Tender for Gasholder," must be delivered on or before Saturday, the 19th of September, 1891.

DAVID CLARKE,
Engineer and Manager.

Gas Offices, Ashton-under-Lyne,
Aug. 29, 1891.

LOWESTOFT WATER, GAS, AND MARKET COMPANY.

AMMONIACAL LIQUOR.

THE Directors of the Lowestoft Water, Gas, and Market Company are prepared to receive TENDERS for the purchase of the whole of the AMMONIACAL LIQUOR produced at the Works for One year, ending the 31st of August next.

The Liquor will be delivered into Barges or Tank-Trucks at the Railway.

Tenders, stating price per 1000 gallons for every degree of strength, from 10 to 16 ounce Liquor, to be addressed to the Manager, in envelopes, endorsed "Tenders for Ammoniacal Liquor," to be delivered not later than the 23rd day of September, 1891.

The Directors do not bind themselves to accept any tender.

JOHN AYRIS,
Manager.

Lowestoft, Sept. 12, 1891.

BOROUGH OF BURTON-UPON-TRENT.

SCRUBBER-WASHER.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the supply, construction, and erection of a new SCRUBBER-WASHER, for 2,000,000 cubic feet of gas per 24 hours, at their Gas-Works in the said Borough.

Persons tendering must submit with their tender detailed Drawings and Specification, and must state where similar Scrubber-Washers have been erected.

Sealed tenders, endorsed "Scrubber-Washer," are to be delivered to me at or before Ten a.m. on Wednesday, the 30th of September inst.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
Sept. 1, 1891.

BOROUGH OF BURTON-UPON-TRENT.

EXHAUSTER.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the supply, construction, and erection of a new EXHAUSTER, for 80,000 cubic feet of gas per hour, at their Gas-Works in the said Borough.

Persons tendering must submit with their tender detailed Drawings and Specification, and must also state particulars as to space occupied, and what power will be required for driving.

Sealed tenders, endorsed "Exhauster," are to be delivered to me at or before Ten a.m. on Wednesday, the 30th of September inst.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
Sept. 1, 1891.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY MEETING of the Shareholders in the above Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 22, at One o'clock, for the purpose of receiving a Report and Statement of Accounts from the Directors for the Half Year ending June 30, 1891.

The Transfer-Books will be closed from Sept. 15 to 22, both days inclusive.

By order,
ARTHUR J. KING,
Secretary.

9, Queen Street Place, Cannon Street, E.C.,
Sept. 8, 1891.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given, that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 30th inst., at half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is hereby also given, that the Transfer-Books of the Company will be closed on the 19th inst., and re-opened on the 1st of October.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C., Sept. 9, 1891.

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Land and Estate Agent; Rating Surveyor and Valuer; Chairman of the Tamworth Gaslight and Coke Company.

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All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

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Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,
PATENTEE OF
A SPECIAL COMPOUND
FOR THE CURE OF STOPPED ASCENSION-PIPES,
A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power
PRICE AND PARTICULARS ON APPLICATION.
Head Office: CORPORATION STREET, BIRMINGHAM.

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

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LTD.,
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Manufacturers of the "Thomas" Patent Lamps for general lighting, also for Public Buildings, Institutions, &c., and for outside purposes.

The best Regenerative Lamp in the Market.

Special quotations to Gas Companies.

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AND
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Manufacture and keep in Stock at their Works (also large stock in London) PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

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Assoc.M.Inst.C.E., M.Inst.M.E., Fel. Inst. Patent Agents,
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Special experience in Gas and Ammonia Plant.

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Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

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STEEL OF ALL DESCRIPTIONS.
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ANALYSIS AND PRICES ON APPLICATION.
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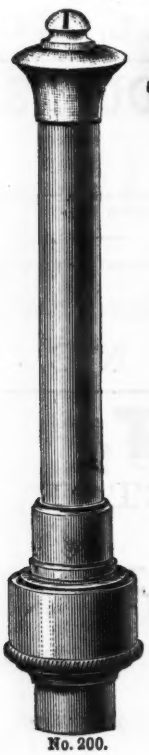
Telegraphic Address: "ORME OLDHAM." Telephone No. 93, OLDHAM.



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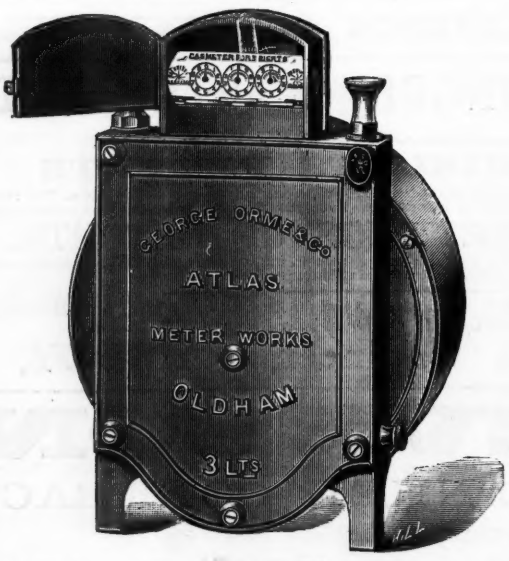

WET GAS-METER IN CAST-IRON CASE.

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ORME'S GAS REGULATOR (BEHL'S PATENT) FOR STREET LAMPS,
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Adopted by the leading London and Provincial Gas Companies. More than 150,000 now in use.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

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The Pumps are provided with suitable Valves for pumping Ammoniacal Liquor, Tar, and Water; and each is provided with Disengaging Gear, in order that any one can be stopped or started while the Engine is in motion.

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Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

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IN IRON OR STEEL
BY SPECIAL HYDRAULIC
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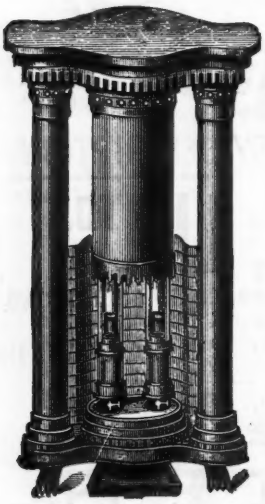

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(CLARK'S PATENT.)

Hygienic Gas-Heating Stoves

For Use Without a Flue.

NO FLUE REQUIRED. NO SMOKE. NO SMELL.
NO DIRT OR TROUBLE. NO DANGER.

All sulphurous Vapours are condensed inside the Stoves, and passed off as liquid into the tray beneath.

The "SYPHON" Hygienic Gas-Heating Stoves give a pure, equable, and agreeable heat, which can be graduated and sustained at the will of the user. They are so constructed that a moist or dry atmosphere is obtained at pleasure.

They are the Only Safe Stoves for use in Greenhouses, Conservatories, Bed-rooms, &c., and especially suitable for Halls, Sitting-Rooms Offices, Shops, Schoolrooms, and Theatres.

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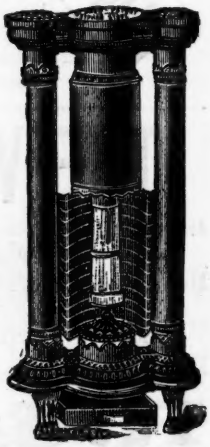
Telgraphic Address: "Syphon Stoves London."



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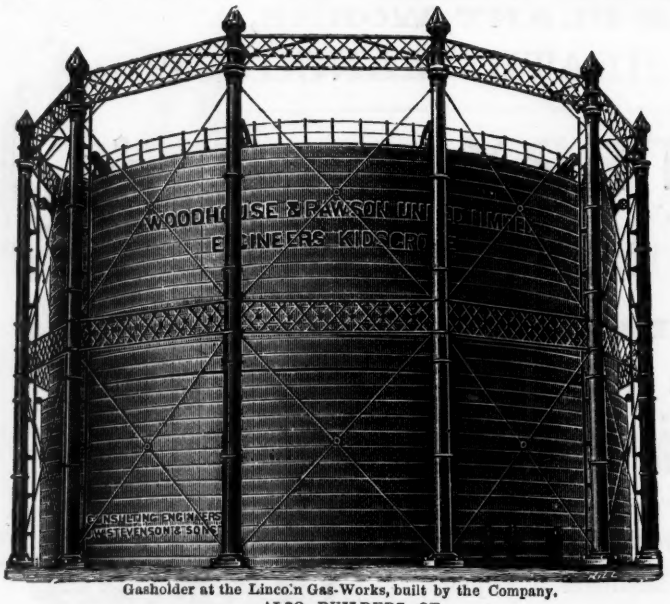

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Shipments Promptly and Carefully Executed.

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LANEMARK CANNEL
AND GAS COALS.

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Shipping Ports: All the principal Scotch Ports.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, L'Union des Gaz, and by many other Gas Companies both at Home and Abroad.

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Gas Companies are solicited to try Samples of the
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MIRFIELD (GAS-COAL) COLLIERY COMPY.
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TYNE
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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

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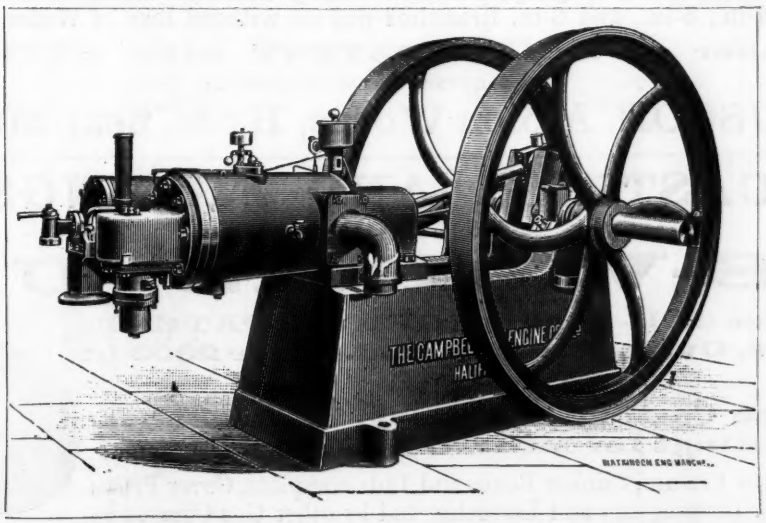
MOST SIMPLE AND MOST EASILY MANAGED.



MOST ECONOMICAL IN GAS AND LEAST LIABLE TO BREAKDOWNS.

Our Engines are used by Her Majesty's War Department; The South Metropolitan Gas Company, London, S.E. at the Sydenham Gas-Works; Tiverton Gas-Works; Filey Gas-Works, &c.

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RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

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MANUFACTURED BY THE

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The most successful and approved Apparatus known up to the present time.

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FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

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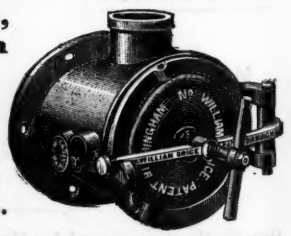

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Charging Doors and Frames, Clinker Boxes and Lids complete, Cover Plates and Lids as used at Birmingham and Leicester, and by other Gas Companies.

Purifiers, planed Joints, and Lifting Gear. Ascension, Dip, Arch, and H Pipes. Fire Doors and Frames. Boshes, Deadplates, Bars, Tar-Boxes, Sight-Hole Boxes, Street Caps and Stoppers, Street Valve Boxes, and all Cast-Iron Requisites required in a Gas-Works.

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AUTOMATIC SYSTEM OF CHARGING AND DRAWING

INCLINED GAS-RETORTS.

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By this process there is obtained—

1. A SAVING OF **70** PER CENT. IN THE CARBONIZING OF COAL.
2. AN AVERAGE SAVING OF **2s. 3d.** PER TON ON ALL COAL CARBONIZED.

Which represents a saving of **One Million Sterling** per Annum to Gas Companies in the United Kingdom alone.

This System is being largely adopted at several places on the Continent and in America, and at various Gas-Works in England—notably at the Works of The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Brentford Gas Company.

For Illustrated Description, see Advt. p. 418.

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SPECIAL FACILITIES TO GAS COMPANIES.

NEW CATALOGUE AND PAMPHLET ON REGENERATIVE GAS LIGHTING NOW READY.

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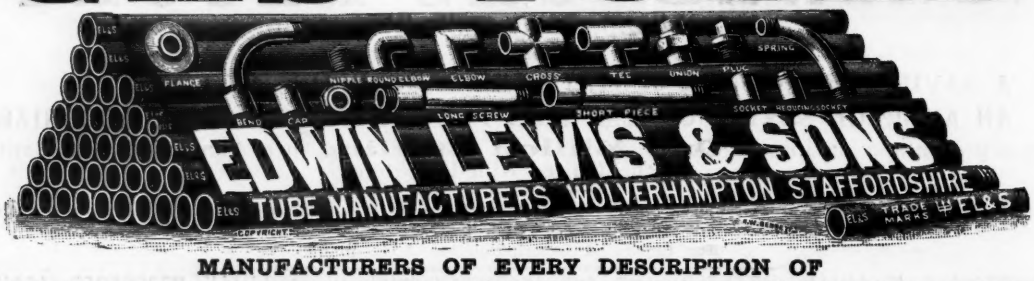

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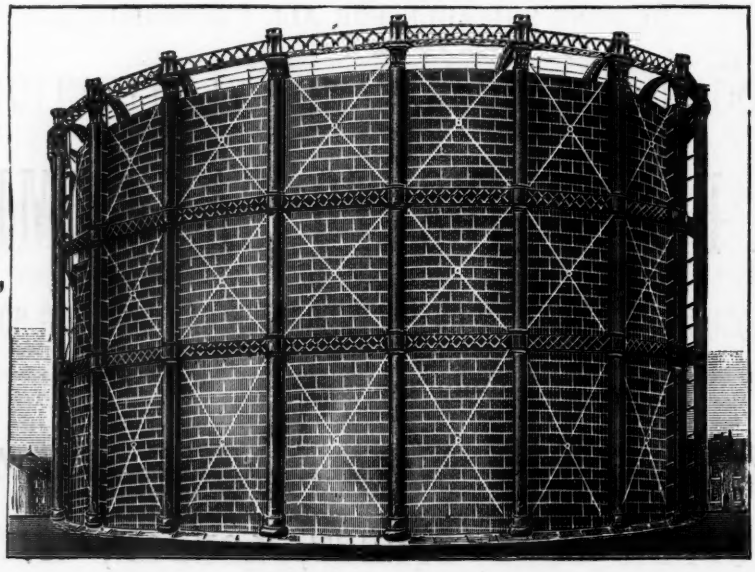

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Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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(Established 50 Years),

PATENTEES

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Drawings, Specifications, and Estimates supplied.

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Specialities in CARBONIZING PLANT.

GENERATOR AND REGENERATOR FURNACES.

OVENDEN,

HALIFAX (YORKS.)

USED AT THE GAS-WORKS

AT

Ascot, Birmingham, Broadstairs, Bromsgrove, Hendon, Ilkeston, Kildwick, Knutsford, Leven, N.B., Pembroke, Seaham Harbour, Stamford, Harwich, Uttoxeter, Wigston, &c., &c., and by Corporations and leading Engineers throughout the Country, for preventing

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Absolutely Harmless and free from Acids.

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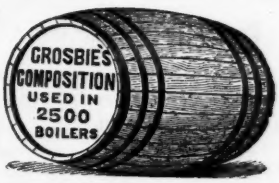
Crosbie's Paints for Gas-Works. Economical and Durable.



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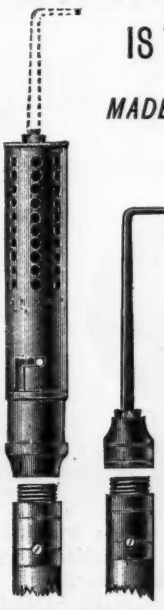

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STRONG AND DURABLE.

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Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

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The only Washer without moving parts that can be fixed before an Exhauster.

No more Gas spoilt by over-running the Exhauster.

Perfectly Self-acting.

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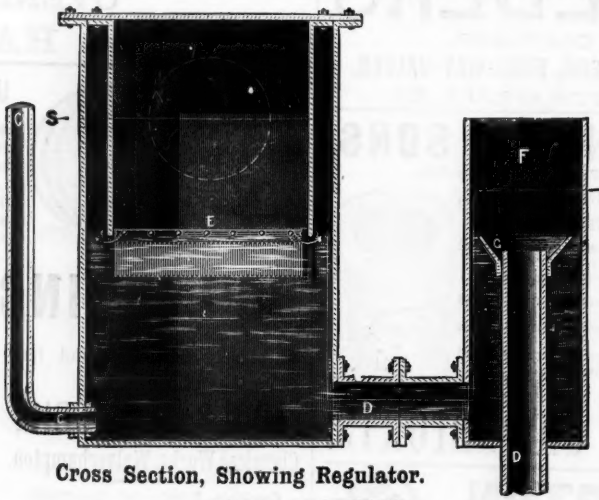

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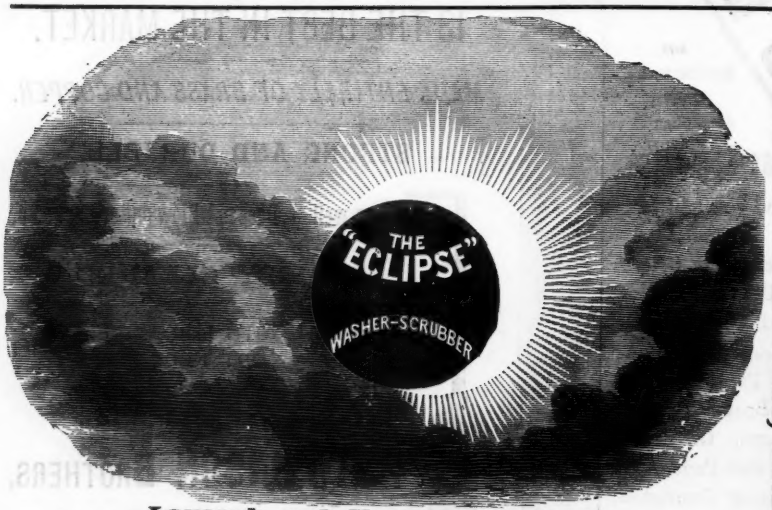

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MACHINES with a total capacity of **42,500,000** cubic feet now working, and give great satisfaction.

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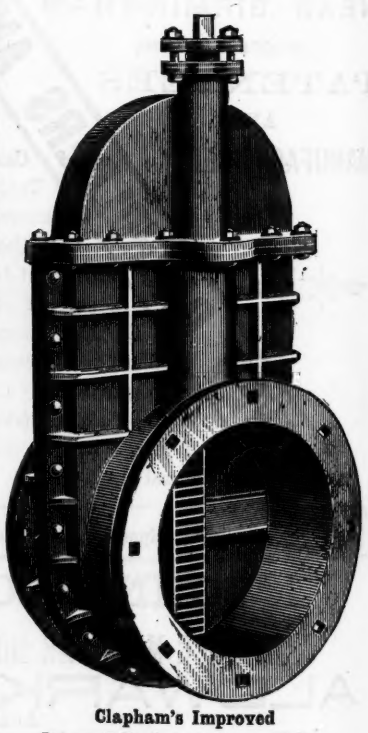
SILVER MEDAL, Inventions Exhibition, 1885.



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